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AUTHOR Hammond, W., Ed.
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ABSTRACT

This booklet presents a variety of environmentally oriented activities that may be used on school sites, many interdisciplinary in nature. The activities are cross referenced according to two separate index systems: (1) by discipline area, and (2) by topic. Discipline areas include Language Arts, Mathematics, Science, Social Studies, Art, Home Economics, Physical Education, and Special Education. Examples of topics are acorns, age, ants, art, attitudes, averaging, clouds, collages, diatoms, descriptive words, government, haiku poetry, insects, and wilderness survival. Due to the flexibility of many of the activities within this booklet, specific grade levels are not designated. The activities are appropriate for kindergarten, elementary, middle, and high school students. (Author/RH)

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# ON CAMPUS TEACHING

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# ACTIVITY GUIDE

'ONMENTAL EDUCATION
LEE COUNTY SCHOOLS

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

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TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC) AND USERS OF THE ERIC SYSTEM."

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THIS PUBLICATION IS PRINTED ON 100% RECLAIMED WASTE
IN AN EFFORT TO REDUCE ENVIRONMENTAL IMPACT BY MAKING
MORE EFFICIENT USE OF EXISTING RESOURCE

PREFACE

Our environment encompasses all of the external and internal stimuli that affect us each day of our lives. How we interpret and react to these stimuli is as varied as the stimuli themselves. One of the major objectives of Environmental Education is to form positive reactions and attitudes toward our environment.

During the first five years of school, most environmental activities are directed toward a development of environmental awareness. The middle school years concentrate more on formation of knowledge concerning the environment or environmental problems. The high school years focus on environmental action.

The concepts and basic principles concerning the workings of our environment can be taught in backyards, vacant lots, off-campus field sites, or on the school campus. Since most children relate best to an area with which they are familiar, the school grounds are ideal for teaching environmental activities.

The school campus can be used on a day-to-day basis and should be viewed as an extension of the indoor classroom. Almost all disciplines can effectively use the campus as a teaching tool.

In most cases, children are overwhelmed by field trips to off campus areas. Learning does take place, but the old adage of "too much, too soon" often prevents students from obtaining the full potential of learning from an off-campus field site. By using the school campus as a teaching tool, an essential step in building an awareness and knowledge base is made. Thus, a more complete understanding of the off-campus field site can be obtained.

It should be mentioned that children are conditioned to associate the classroom with work and the outdoors with play. A teacher's first field trip teaching experience with children may likely prove discouraging as the absence of classroom strictures may produce minor discipline problems. Repeated use of the outdoors as a teaching medium will serve to overcome the "conditioning" of viewing the outdoors solely as a playground. A degree of patience and a more firm hand than usual may be required for the first few outdoor assignments. Use large group activities first and then gradually work into individual activities or small group activities.

This booklet presents a variety of environmentally oriented activities that can be used on school campus sites. Many of the activities are interdisciplinary and lend themselves to this type of teaching. By using your own creativity, you should be able to mix other disciplines with your own specific field.

## HOW TO USE THIS BOOKLET

The on-campus activities in this booklet are cross referenced according to two separate index systems: (1) by discipline area and (2) by topic and subject. The teacher desiring a class activity which deals with art, language arts, etc., would thereby turn to the "Index of Activities by Discipline Area" on page iii. Each activity is individually numbered. Those numbers in the index which follow the discipline title are activities in the booklet which relate to that discipline.

A teacher who wishes an activity relating to "Ants" or an activity which encompasses a specific concept such as "change," would turn to the "Index of Activities by Topic and Subject," which begins on page iv.

Due to the extreme flexibility of many of the activities within this booklet, they are not defined toward specific grade levels. The activities are appropriate for kindergarten, elementary, middle, and high school students. An activity directed toward elementary children may be modified by a creative high school teacher to satisfy the needs of a high school class. For many teachers, the enclosed activities will provide an idea from which will emerge a separate activity for the school grounds from their own imaginations.

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1. ENVIRONMENTAL AWARENESS

Take your children out on campus and have them discover objects relating to texture, shape, density, temperature, and size. Provide a work sheet using the following categories and words, with enough room for the students to write the names of objects that satisfy the words:

Size: heavy, thick, short, tall, small, large, narrow, big, little, miniature, etc.

Shape: oval, round, lobed, toothed, ridged, oblong, square, triangular, smooth-edged, pointed, curved, etc.

Texture: furry, hairy, waxy, knobbed, ribbed, soft, hard, slimy, velvety, coarse, slick, etc.

Density: solid, thick, lumpy, hollow, compact, spongy, porous, nonporous, etc.

Temperature: cold, hot, moist, wet, dry, clammy, damp, cool, lukewarm, etc.

How many of these words could be satisfied in one square meter of the campus? How many could be used to describe a tree? A building? A sidewalk? A weed area?

2. FIVE SENSES IN NATURE

Have your class go outdoors for approximately 10 minutes to observe and mentally record their surroundings. Return to the typing classroom. Using their typewriters, have the students list, in rough draft form, what they can recall from their outdoor observations that would fit under the following headings: seeing, hearing, tasting, smelling, and feeling. The rough lists should then be discussed for additions, subtractions, and changes. The students should then proofread and calculate columnar tabulations for typing one, two, three, four, and five column typings. Stress the importance of horizontal and vertical balance, The final table can be entitled, "Five Senses in Nature."

3. TO SMELL IS SWELL

Lead your class to the most natural area you have on campus. Instruct children to smell as many flowers, plants, vines and trees as they can. Ask them to choose: (1) the fragrance they like the most; (2) the fragrance they like the least. Demonstrate to class before they begin activity the proper method of smelling a leaf. With the thumb and forefinger, rub the leaf to release the fragrance of the plant. Bend your head down to the plant to smell. DO NOT break off the plant and lift it to your nose. Emphasize respect for living things. Teach children to recognize poison ivy before they disperse on their own.

4. FOLLOW THE ODOR?

Explain to your students that they are to follow their noses in this exercise. Rub a large onion on different objects found about the campus, such as trees, swing sets, and buildings. Mark the "Odor Trail" a few minutes before class begins. Discuss how animals use odors for finding food and marking their territories.

5. TRUST WALK ACTIVITY

Take your students on a "Trust Walk." Each group should blindfold one person; the other group members should slowly lead this person around a section of the campus and explain what they see and feel. Give each person in the group a chance to be "blind," while the others do the explaining. Discuss the use of language and the art of communication.

6. NATURE MEMORY

Take your students outdoors and test their memory powers. Take a short walk around the campus. As you walk along, pick up small objects such as acorns, twigs, berries, etc. Place these items in a paper bag. Do not tell the children why you are placing the items in the bag. At the end of the walk ask the students what things are in the bag. Each student should get one guess. After completing this part of the activity, tell the students that you will repeat the activity. Did the class do better when they knew that they were supposed to remember what was placed in the bag? How many trials did it take before a perfect score was made? Discuss the advantage of note-taking to help people remember things that happen.

7. TOUCH EXERCISE

Place a branch from a tree or a specimen of a weed in a "Feel box" (cardboard box with hand hole and rag cover). Take Feel box to a portion of campus where the plant occurs. Instruct students to "feel the plant" and locate it without having "seen" the specimen. It works well to discuss before the types of things for which one should feel: length of leaf, margins toothed or smooth, surface waxy or fuzzy, stem warty or smooth, stem thorny or without thorns, etc. A variation of this activity is to have your students divide into groups and search the school grounds for an object to place into a "Feel box." Students attempt to guess each group's chosen object by feeling the item through an armhole in the side of the box. Utilizing several feel boxes or feel bags, allow students to feel various secret objects selected by the teacher. With pencil and paper, students should (1) describe the object by using one carefully chosen word (e.g. sticky, rough, sharp, etc.); (2) write down what they believe the object to be.

8. SOUNDS AND EYES

Divide the class into pairs. Take your students outside. Blindfold one person in each pair. The students should seat themselves somewhere on the campus. Try to keep groups separated by at least 20 feet. No one should talk or make noise. After 10 minutes of quiet sitting, students should begin to keep track of the number of sounds they hear in 15 minutes. They should try to discriminate between different sounds. At the end of the 15 minute period, who heard the largest number of sounds - the blindfolded person or the other person? Get a class average. Why did the class receive the results it did?

9. LISTENING AND SOUNDS

To help students develop listening ability, auditory discrimination, and auditory memory, take your class outdoors and have them keep a record of all the sounds they hear in 15 minutes. Draw pictures of the things making the sounds. Start a round-robin discussion where each child names a sound that he heard but he may not repeat any sounds already mentioned. This will reinforce the memory aspect of the exercise. Make a bulletin board with the title of "Sounds on School Grounds."

10. WIND PICTURES

Have your children go outdoors and sit quietly in a shady spot. Tell them to close their eyes and listen to the wind. The children should try to picture what the sounds of the wind look like and then make a drawing of the wind. Place the drawings around the school so that others may become more aware of the wind. Try this exercise on a windy day, and again on a day when only a light breeze is blowing.

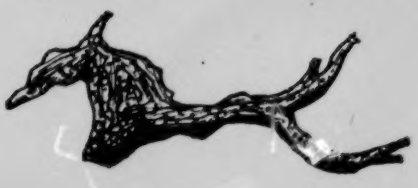
11. DRAWING SOUNDS

With children out-of-doors, instruct them to, "draw a picture of the SOUNDS" they hear; not of the things that make the sounds, but of the sounds themselves.

12. INVISIBLE NATURE

Have your students go outside and ~~draw or~~ write about something that is invisible, or at least not visible to the unaided eye. Discuss the stories ~~and drawings~~. How would the invisible thing be affected by water, air, noise, or soil pollution?

13. STICK THAT LOOKS LIKE AN ANIMAL



Students should find a stick or some other object that they believe looks like an animal. When the class reassembles, have students hold up their "animals", one at a time. The rest of the class should try to guess (aloud or in writing) what animal is being depicted.

14. ALIKE - UNALIKE

Ask students to find four different things that can be grouped together by something they all have in common. Examples such as leaves are frequently chosen. Emphasize the idea of similarities to help them group items. Show the differences that exist among the four items.

15. INTERACTION AMONG LIVING THINGS

Have your students go outdoors and identify different objects and the interaction among those objects. Each student should pick some natural thing, and then compose a list of other things that interact with this chosen object. Example: Pine tree - sun, air, water, soil, birds, fire, insects, man.

Have the class discuss the results. Students should feel free to challenge any items.

16. LIKE - DISLIKE

Children go out on the school grounds and make a list of (1) three things they like; (2) three things they do not like. When the class reassembles, children discuss their results.

17. LARGE OR SMALL

If a natural area is available for the students, ask them to divide into small groups and write, describing whether the area makes them feel large or small, and why.

18. YOUNG AND OLD

Ask students to search school grounds to "find the youngest and oldest living thing" they can. Ask the students to "find the youngest and oldest non-living thing" they can. Discuss results.

19. DEPENDENCE

The class should be instructed to find an example that shows how one plant is dependent upon another plant.

20. FIND SOME JOY

Take your class outside for a short walk around the campus. The children should look for things that give them a feeling of joy. Whenever the mood hits, a child should feel free to say what is eliciting this response. In order to get the children "into" this activity, the teacher should be dramatic and enthusiastic.

21. CONCEPT OF CHANGE

Students prepare a list composed of two columns, headed: "What is changing?", and "How is it changing?" Allow class to choose 7-10 items while walking about school grounds, and place each within the above categories.

22. CHANGE - LIVING AND NON-LIVING

Ask students to "find evidence that some living or non-living thing is changing." Stress the idea of change and that nature is always undergoing change.

23. CHANGE AND ITS EFFECT

As a follow-up exercise to #16, have children review the listing of things they did not like and make two major decisions: (1) What would you do to correct or change the things you did not like? (2) What changes or side effects would result from your corrections? Emphasize "Interrelationships" and write on blackboard the quote from John Muir, "When we try to pick out anything by itself, we find it hitched to everything else in the universe."

24. THINGS NOT CHANGING

Ask students to identify three items on the school grounds which are not changing. After students have compiled a list, discuss results. Ask what their choices will look like in 10 years, 100 years, 1000 years. Emphasize that there is really nothing that is not changing.

25. GOOD AND BAD CHANGES

Ask students to locate evidence on their school grounds for a good and a bad change. Students should be prepared to support their answers. Teams are established as a "good change" team and a "bad change" team. Each team collects its list and a class debate is held considering which effect the school has most produced on the environment.

26. THREE WORD CHANGE

Have your students go out on the school grounds and locate things that have undergone change. The students should use three words to describe what they have seen. The first word should tell what the thing that changed was, the second word should explain what the agent of change was, and the third word should either explain the result of the change or something else that was affected by the change. Read the word groups to the class. The class should feel free to argue about the words used. Example: Tree - fire - bark; Animal - sticker - pain.

27. HAVE PEOPLE BEEN HERE?

On an undeveloped portion of the school grounds, students should show "three kinds of direct or indirect evidence that people have been there." Encourage originality. Most students will choose litter as direct evidence. List as many examples as possible.

28. MOVEMENT

Take your students outdoors and have them identify as many moving organisms as they can find. Discuss the method of movement that each animal uses. Why do the animals move from one area to another? (Probably looking for food.) Students should determine the rates of movement for as many of the animals as possible. Discuss the term, "rate," and give a simple example of how it can be determined. Allow your students to determine the methods and procedures they will use. Compare movement rates of the different animals.

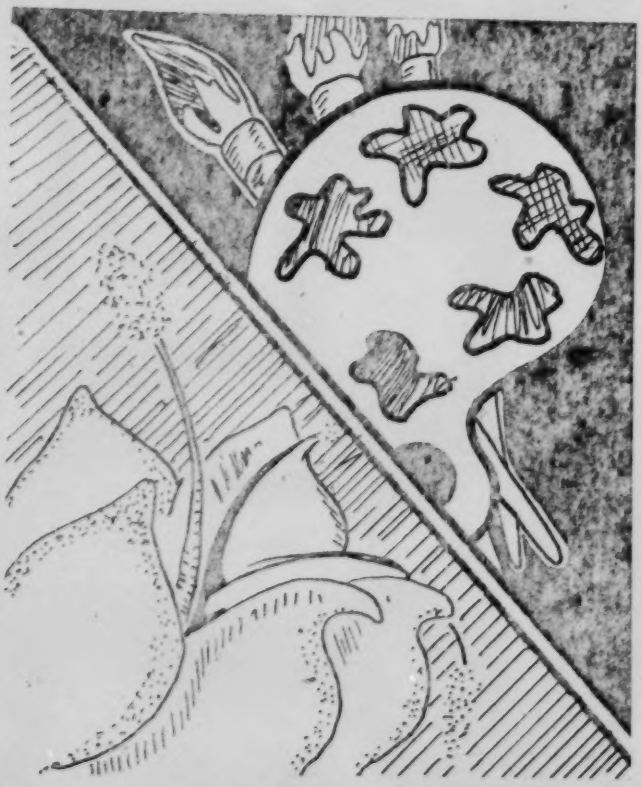
29. ENERGY AND YOUR SENSES

Take students outside and ask them how many ways they can hear energy, see energy, and feel energy. Keep a record of their thoughts. Then discuss which of these things could have been experienced 100 years ago. What would happen if the same questions were asked 100 years into the future?

30. PATTERNS AND COLOR

Stress with class how all things have patterns and colors form patterns. Compare in classroom the green chalkboard; pens are black or blue; fire extinguisher is red, etc. Outdoors, notice leaves are green, trees are brown, clouds are white, etc. Next stress that everything has a color for a reason. Chalk is white so it can be seen on a blackboard. Dark ink is used on white paper so that it can be seen. Red signals danger and helps to gain our attention. Outdoors, stress camouflage of insects. Brightly colored insects indicate danger. Leaves are green due to chlorophyll, which assists in photosynthesis.

31. FAVORITE COLOR



Ask children to declare their favorite color. They should write this color at the top of a piece of paper. Next walk around the school grounds and children search for and list as many natural things as they can find which contain their favorite color. Next search through the school or classroom for their favorite color. Is their favorite color found more often in man-made or in natural objects?

32. IMPROVISATION ACTIVITIES

Take your class outdoors and direct the children to role play what might happen in some of the following situations: A forest ranger, confronting a group of campers who have littered the area; an environmentalist, confronting a group of land developers; a commercial fisherman, confronting a dredge operator; a member of the Audubon Society, confronting a County Commissioner about zoning laws and population growth; a Z.P.G. expert, confronting a group of large families.

33. PANTOMIME NATURE

Have your children pantomime the actions involved in planting a tree, building a bird nest, wind, trees moving in the wind, a hurricane, waves on a beach, a blossoming flower, a seed growing into a plant, movement of different animals, etc. This creative expression helps children to identify with objects in nature.

34. DON'T HUNT ME

Have students describe what it would be like to be a hunted animal. Go out on the school grounds and have three or four students play the roles of a deer family. The other students should be hunters. What feelings do the hunters have for the deer? How do the deer feel about the hunters? What happens when a member of the deer family is killed? Why are the hunters hunting?

35. TAKING THE PLACE OF WILDLIFE

Have your children play the role of bees, flowers, mice, owls, trees, telephone poles, buildings, grass, soil, and air. Instruct the students to act like the thing they are playing, except that they are able to talk. Make up one of the following situations for the play acting: the day the sun didn't shine; the day there wasn't any water; the day the food ran out; the day when air pollution was bad; the day noise pollution was bad; the day people littered the area.

36. MAKE-BELIEVE ANIMAL

After visiting a natural area or focusing attention to the miniature life which abounds in a clump of moss or within the leaf blades of a lawn, ask children to use their wildest imaginations and draw a picture of a make-believe animal or plant that might live here.

37. LIVING INSIDE A LEAF

Ask students to describe in writing what it would be like if they were living inside one of the leaves in the forest.

38. WATCHING AND IMITATING

Instruct each student to find some living thing in the area. Watch it closely. When the class reassembles, each student should try to imitate the living thing he observed and the class should try to guess what it is.

39. UGLY TO BEAUTIFUL

Take your class outdoors and give them the following instructions. Find some natural thing on the campus that at first sight appears ugly or not particularly beautiful. Examine the object closely and look for beauty in it. Describe the beauty you see. The descriptions can be made orally or in a written form. Discuss how this same principle can relate to people.

40. A COMPLAINING ENVIRONMENT

Take the students out on campus and have them pick some living thing on which other living things are dependent. The students should write a short story or essay concerning how the dependent organisms would feel and react if the thing on which they are dependent were destroyed.

41. WHAT DO THINGS SAY?

Take students outside and tell them to bring back natural and unnatural things that "say" something to them without words. Have the class discuss what the object is trying to tell them.

42. NOISY INVADERS

As a follow-up to some of the aesthetic awareness exercises, ask children in the outdoors to describe in writing how they would feel if they were a plant or animal living here and a bunch of noisy people came into this area.

43. WHO'S AFRAID?

Have your students conduct a survey of why other students are afraid of spiders, snakes, rats, and bats. Have each group take a different animal on which to report. Discuss the results of the survey. Look for reasons that are similar for each animal. What methods could be used to help people get rid of these fears?

44. NATURE SHOW AND TELL

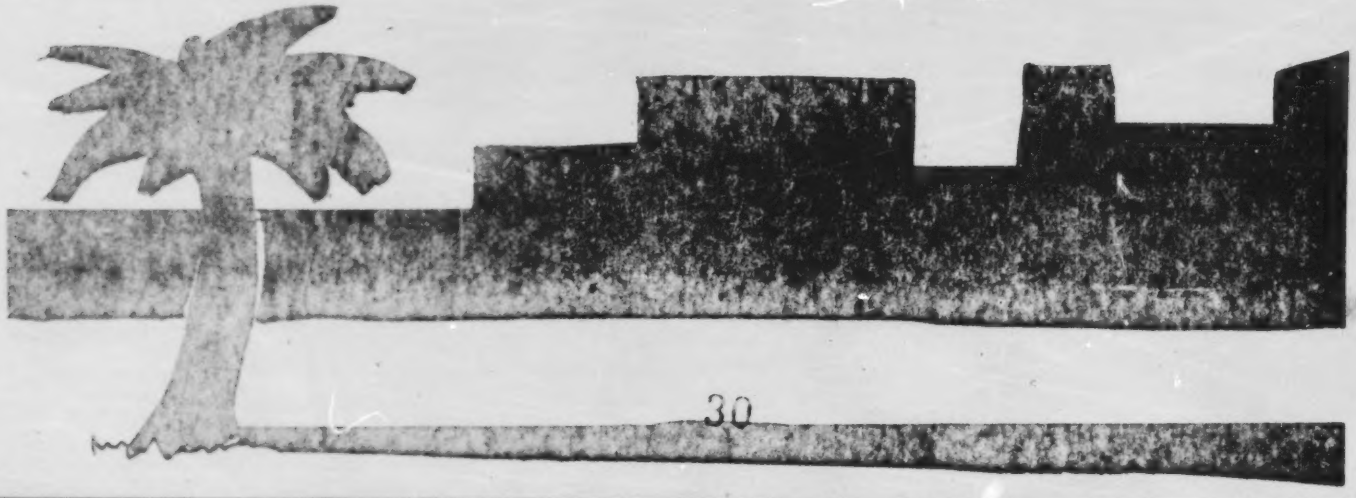
Have your students collect one thing from the school grounds. These things could be rocks, leaves, seeds, etc. Whenever possible, the object should be something the student has never seen before on the school grounds. Each child should hold his object up for others to see, then the rest of the class should tell what they know about this object. A variation on this activity is to place the objects around the room. Place a sheet of paper by each one. Allow the students to roam the room looking at the items. If a student knows something about the object, he should write what he knows on the paper near the object. Read the papers to the class.

45. SOUNDS AND THEIR SOURCES

Children visit the school grounds and listen for sounds. Instruct them to stand still in silence and make a listing composed of two columns. (1) The sounds they hear (in descriptive words, e.g. "Bang" - "Buzz"). (2) The source of each sound. Next, ask them - how are these sounds similar? How are they different? Which sounds are more pleasant than others? Why? Back in the classroom ask students to make a list of what sounds might appear at certain times of the day and therefore be predictable? Are there sounds that never stop? Ask students to write a story about what they believe the tiniest sound in the world might be.

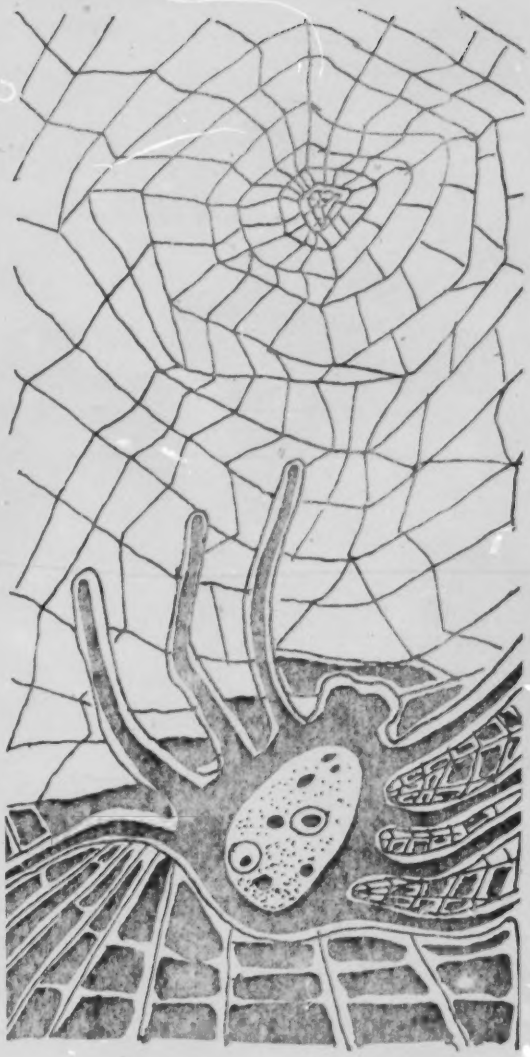
46. SHADOWS

One of the best ways to learn about the sun is to observe shadows. For pre-primary and primary grade children who have never explored shadows, this can be a simple discovery of shadows, the things they do, and their cause. Put children in a circle and let them count the shadows in the circle. Does everyone have a shadow? Let them all find their shadows. What else has a shadow? Which way do all the shadows point? A shadow is really a no-sun-spot. Find the biggest no-sun-spot on your school ground. What made it? Find the smallest no-sun-spot. Can children make their own no-sun-spots bigger or smaller? Can children see that the amount of sunlight that an object blocks is related to the size of the object?



47. OBSERVATION SKILLS

Walk students to a natural area on campus. Choose any item, such as a tree, flower, a spider in a web, etc. Instruct the class to observe the item for several seconds remembering as much as possible, making a mental picture of the object in their minds. Now turn the class facing away from the object and instruct them to answer a series of questions about what they observed without looking back. An example of such questions that might relate to a spider in a web might include: How many spiders were there? In what portion of the web was the spider located: upper left, lower left, center, etc.? To what objects were the web "cables" attached? What was the dominant color of the spider? Students should write down the answers to insure full participation



48. MINIATURE WORLDS

Divide your class into small groups. Give each group a hand lens or magnifying glass. Take the class outdoors and instruct them to write a short story about the miniature world as seen through their hand lens. As a science activity, ask students to look for similarities between the miniature and large world. Make a list of these things. What differences are there? What things move? Do you see any signs of animal life?

49. WHY IS SOMETHING HERE?

Have the students go out on the school grounds. They should pick anything that interests them and try to discover why it is where they found it. This can lead into subject areas such as seed dispersal, erosion, water movement, and man's influence on objects.

50. OBSERVING A LAWN

Following a similar example to #54, Observing a Tree, ask children to write down 10 words that seem significant to their distant observations of the lawn. Next, students should lie on their stomachs on the lawn with their faces deep into the grass as close to the ground as possible. Instruct them to simply observe closely for a few minutes, then, at your signal, they should write down 10 words that seem significant to their observations from this position.

51. LIVING THINGS REPRODUCING

On the school grounds students find as many examples of living things' reproducing as they can locate. Compose two lists, one for animals, another for plants. Common examples for animals are eggs of insects beneath boards, young spiders near web, insect cocoons beneath the eaves, bird nests, etc. Plant examples may include the presence of seeds, or seedlings, etc.

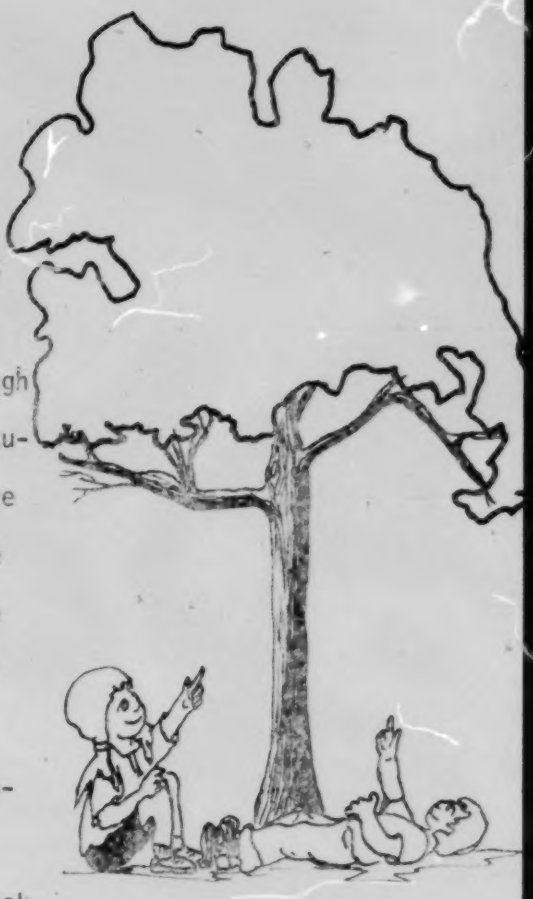
52. MAKING BIRD NESTS

On the school grounds instruct children to construct a bird's nest, using materials available to them from nature. The problems and complications will become evident to the children as they progress. Test the completed nests by seeing if they can be picked up from the ground. At the end of the activity, examine and disassemble a real bird's nest.

53. PLANTS AND LIGHT

Students should be instructed to "find an example that shows that a plant needs light to survive." Allow students to present their examples to the class.

54. OBSERVING A TREE



Lead students out of doors with paper and pencils. Instruct the students to sit quietly on the ground facing a large tree. Tell them to look at the tree and write down 10 words that seem significant to their observations of the tree. Tell students to number each word 1 through 10, which will help avoid the complication of students' attempting to write sentences. Next, have them lie down flat on their backs under the same tree and look up. Once again, they should write down 10 words that seem significant to their observations from this position. Next students could be asked to group their words from each observation into three categories - shape words, color words, feeling words, etc. Ask them to look for any differences in the words chosen between both observations.

55. DRAW A TREE

Give each of your children a piece of paper that has a tree without leaves drawn on it. Take the class outdoors and let them draw in the leaves. They should decide what kinds of leaves they will use. A variation on this exercise is to draw a large tree on poster board. Have students collect tree leaves from the campus and paste the leaves onto the posterboard.

56. LIFE ON A TREE

Students look carefully around a tree and list all the animals and plants that are in, on, beneath, and around it. Back in the classroom, challenge children to see how many interrelationships they can work out. Can they make charts showing the web-like quality of life in this small ecosystem?

57. LABELED WALK

Give each of your students a card that has an ecological relationship printed on it, such as: this is a home for a social insect or this is a plant that is dependent on another plant. For young children, drawings and words can be put on the cards. After each student has his card, allow the students to go out on campus and find situations that will satisfy the card's explanations. Each child should place his card next to the object and then tell the rest of the class why he chose the object.

58. HABITAT CARDS

Give each student or small group of students a card with a habitat statement. The students should find an area on campus that will satisfy what is written on the card. An example of a card would be: find a plant that provides food for birds, but this plant must grow in a sunny spot, or find a place where animals could find food.

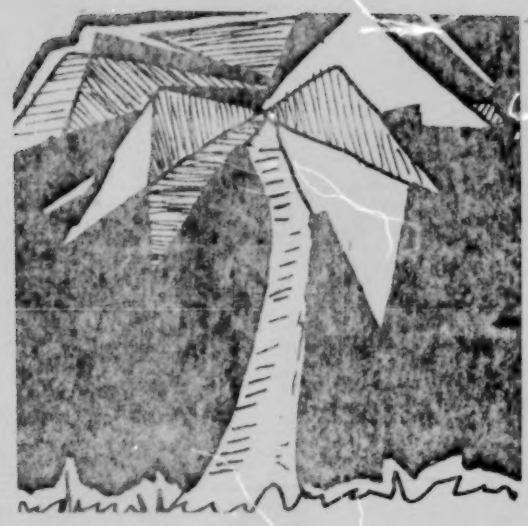
59. NATURE NUMBER QUIZ

Mark off a specific trail or route for your students to follow on the school grounds. Place tags on the trees, shrubs, weeds, grass, animal homes, and other objects along the trail. Each tag should have a question, two choices, and a number value for each choice. Students read the question and then select the right answer. The students should record the number value of their choice. It is usually better to use odd numbers for the values so that no one can get the correct final number without getting all the questions correct. The total score should be compiled at the end of the trail and then go back over each tagged item with the class. An example of a tagged item would be: if this tree has a simple leaf, take 5 points. If this tree has a compound leaf, take 3 points. Another method of asking the question would be: what kind of leaf does this tree have - simple leaf - 5 points; compound leaf - 3 points.

60. PLANT SOCIETY

Have your students go to a campus area that has relatively natural growth on it. Weed patches in ditches or along fences would be appropriate. The students should imagine this area as a plant society. Students should compare this society with their own community. Is there any order to this society? What members of the society seem to be dominant? How are some members dependent on others?

61. THE TREES AND YOUR COMMUNITY



Have students describe some part of the community in which they live. Then take the class outside and gather them around a tree. Have them point out and discuss similarities between their community explanations and the tree's community. Carry the exercise one step further and include the entire school grounds in the similarity explanations.

62. MAKING DISCOVERIES AROUND THE SCHOOL CAMPUS

Instruct the class to make a listing of the following items, or pass out mimeograph sheets complete with blanks for writing in their discoveries. In place of listing, each item can be announced and searched for, one at a time. Students should attempt to locate around the school grounds each of the following:

1. Three simple shapes.
2. Something in nature which gives a sweet and a sour taste.
3. Something which is pleasant to look at.
4. Something which is sad to look at.
5. A pleasant or unpleasant smell in nature.
6. Something older than you and something younger than you.
7. Three different textures.
8. Three primary colors and two secondary colors.
9. A trace from an animal.

63. TRASH TICKET

In Physical Education class, instead of having students run laps at the end of the period, have them find three pieces of litter. The litter becomes their ticket to the showers.

64. TRASH RACE

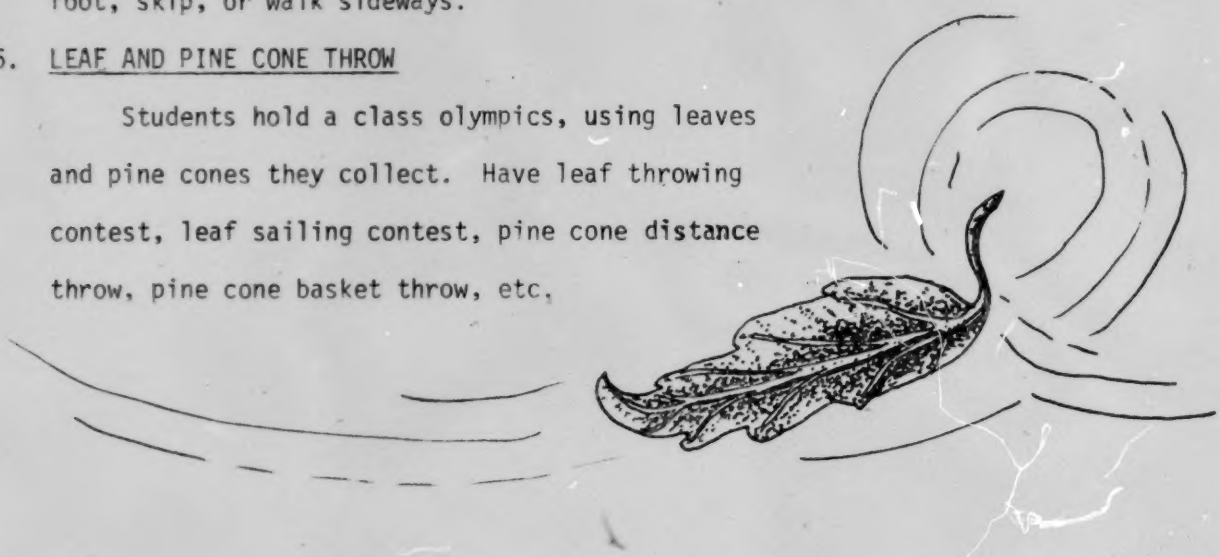
Have the students run a Trash Race. Set boundaries for the race (e.g. the football practice field). Divide the class into teams. Give each team five minutes to collect as much trash from the area as possible. The team collecting the most trash does not have to take laps at the end of the period.

65. LITTER RUN

Take your class outdoors and divide into two teams. The object of the race is to see which team can pick up the most litter in the shortest time. When a signal is given, the first person in each team must collect three pieces of litter and then run back to his team. The litter must be deposited in a garbage bag. Once the first person has completed his task, number two in line must collect three pieces of litter and so on. The first team to finish is the winner. The races may be varied by having students hop on one foot, skip, or walk sideways.

66. LEAF AND PINE CONE THROW

Students hold a class olympics, using leaves and pine cones they collect. Have leaf throwing contest, leaf sailing contest, pine cone distance throw, pine cone basket throw, etc.

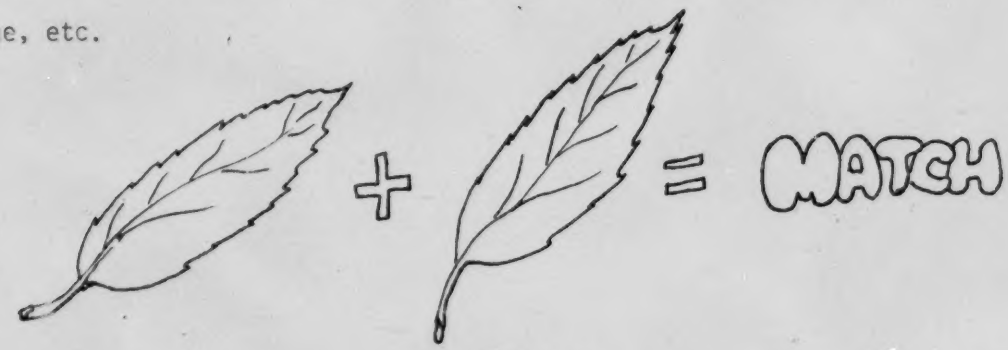


67. LEAF RELAY

Dividing children into two or three lines, choose a leaf specimen for each line (preferably a soft, delicate leaf). At the word, "GO," children pass leaf over their heads to person behind down the line. At the end of the line children turn and pass leaf back, this time between their legs. Catch! Leaf cannot be torn or wrinkled in any way. A piece of onion paper also works well.

68. LEAF RACE AND SEARCH GAME

Using two cardboard boxes as receptacles, children should collect from their school grounds a large variety of leaves from the ground. (About 70 leaves per student.) Do not choose old and crumbling specimens. The teacher collects two or more specimens of each variety. Class divides in half (or in threes, if an additional box is used) and forms lines. The first person in each line runs first to the teacher and receives a leaf specimen. They then run to their box and search to match their leaf with a similar leaf from the box. Finding it, they run to the teacher, show her the match, and receive specimen #2, with which they run, and then pass it to the second person. The second person runs to the box, finds a match, shows match to teacher, receives specimen #3 to pass to third student in line, etc.



69. LEARNING BASEBALL

Using the format of a standard baseball game, divide the class on the school grounds into two main teams. Prior to game, each team composes at least 25 questions (or choose 25 difficult spelling words from their spelling list). The questions should cover the material which has been assigned in class. The teacher serves as the umpire and may disallow questions she feels inappropriate.

Rules: The pitcher "pitches" a question to the student at bat. If the student misses the question, it's an out. A correctly answered question is a "hit" and the batter goes to first base, etc.

70. FIND IT QUICK!

Divide the class into two teams. Designate one team as "A" and the other team as "B." Each student on each team should then count off and remember his number. Thus, there will be A-1, B-1, A-2, B-2, etc. Have the teams line up facing each other. Then call out an item and a number. The first person with that number to bring back the item earns a point for his team. For example, call out, "A seed for numbers 5."

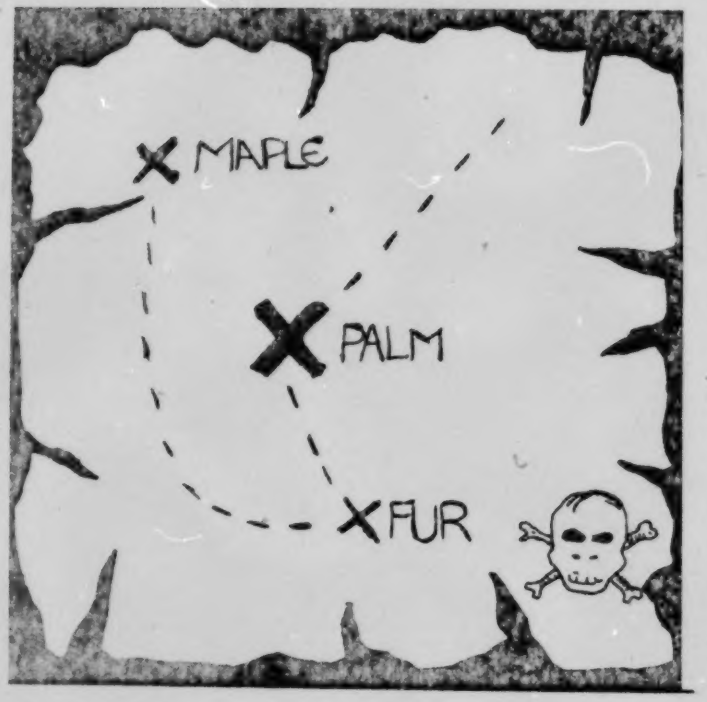
71. WHO RUNS FASTER?

Take your class on campus and measure a fifty foot section of the school grounds. Place a marker at each end of the fifty foot distance. Have each child run, and then walk the distance. Students should keep track of the number of steps they take for each trial. Another student should time the walk and run trials with a watch or by counting seconds. From this data, students can determine the number of feet per second they walk and run and also the average length of a running and walking step. Next, have students determine the rate (feet per second) that an ant moves. Allow the students to determine the method they will use for this activity. Who moves at a faster rate? Man or Ant?

72. NAME GAME

Divide the class into four major groups. Each group is sent to a separate area of campus where a suitable weed or plant growth is present. Groups compile a written list of 10 descriptive plant names for plants in the area. (Pancake tree, wagon-wheel grass, sticker weed, pink flower, etc.) Other groups are given the listings and the opportunity to try to recognize the plants by their descriptive names. A game can be played awarding groups for the adequacy of their descriptions and awareness by giving each group one point for each item recognized by another group, and one point to the group that correctly locates the item.

73. TREE TREASURE HUNT



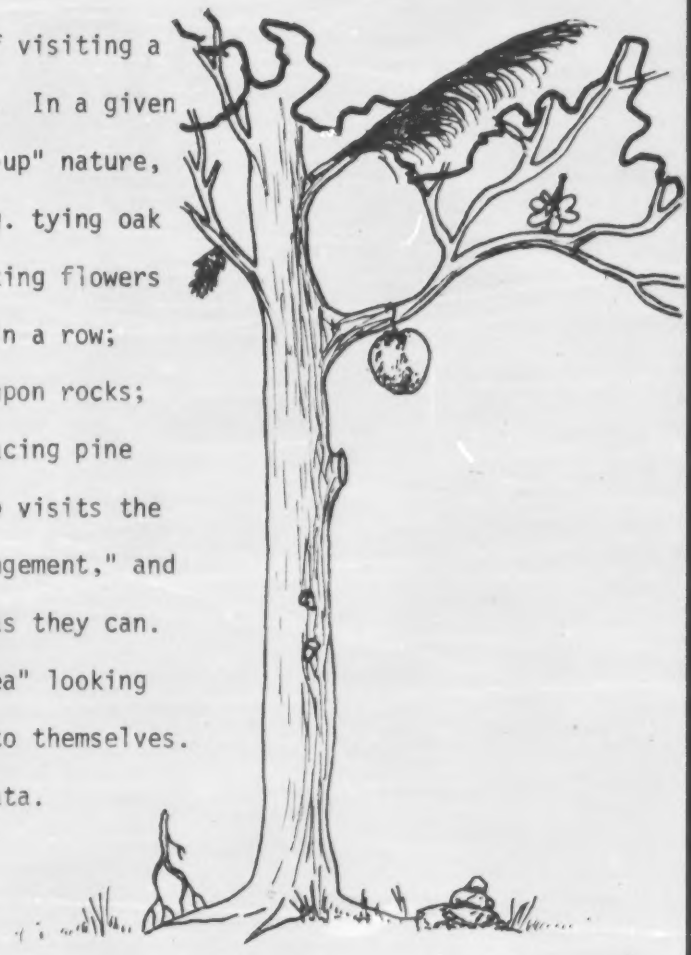

Introduce your students to the major trees on your campus by drawings, pictures, or by actually taking them outdoors to see the trees. Once the students have been introduced to the different trees, set up a treasure hunt game. Use the trees that the students have been studying as landmarks. Hide objects around the campus, and give groups of students treasure hunt maps of the campus. In order to find the treasure, the children must be able to recognize the trees used as landmarks.

74. NATURE CHALLENGE

Divide your class into two groups and take them outdoors. One group should be designated as "non-living" and the other group as "living." Each group is to find as many objects that fit their heading as possible in 15 minutes. A list of all items should be made. The group with the largest number of items wins. Items from one group can be challenged by members from the other group. When a challenge occurs, the challenged group must be able to find the object in less than a minute. Points can be earned or lost by challenge. If a group is unable to meet the challenge, then the other group earns a point.

75. FAKING NATURE GAME

Class divides in half, each half visiting a different area of the school grounds. In a given area each group of children "doctors-up" nature, providing unnatural arrangements, e.g. tying oak leaves to limb of cajeput tree; sticking flowers in the wrong plant; sticks lined up in a row; sticks stuck in ground; rocks piled upon rocks; acorns pushed into trunk furrows; placing pine cones on tree limbs, etc. Each group visits the other group's "unnatural nature arrangement," and attempts to locate as much "errata" as they can. Allow group to approach "doctored area" looking in silence, and keeping discoveries to themselves. Students take turns pointing out errata.



76. NATURE 20 QUESTIONS

Take your students outdoors and have them play 20 questions. All questions must be answerable by yes or no. One student should find an object on campus and then the other students must guess what it is by using the yes-no format.

77. LITTER SCAVENGER HUNT

Compile a list of common litter items of the school ground for a scavenger hunt (against time). List items such as 10 cigarette butts, 5 flip-off tops, 2 milk cartons, 1 cigarette pack, 1 bubble gum wrapper, etc. A survey walk of the school grounds should present ideas for the items listed.

78. OBSERVATION BINGO

Construct a Bingo card and ditto copies for your students. In the squares on the card include items that can be seen on the school campus such as specific trees, ferns, grasses, types of bark, etc. Students are given a time limit to mark the squares containing objects they have found. For younger children, pictures or drawings may be placed in the squares. For social studies, classes may use such things as items that use energy, water, or produce pollution. Art classes could use colors, textures, etc.

| NATURE BINGO | | |
|---|---|---|
| PIECE OF LITTER | PALM FROND | SMALL ROCK |
| RUSTY OBJECT | PINK FLOWER | ANT LION |
| FUZZY LEAF | GRASS FLOWER | PULL TAB |

79. CHECK-LIST SCAVENGER HUNT

Divide the class into small groups of twos or threes. Give each group a list of items that can be found on campus such as: pine cones, bricks, yellow flowers, etc. The list should have enough room so that students can write a short sentence after each word on the list. Give the children ten to fifteen minutes to locate the items. They must write a short description of where the item was found on campus. This type of scavenger hunt prevents over-collection of materials on the campus. A variation of this activity is to make a list of shapes and textures for students to locate.

80. NATURE MEMORY HUNT

Produce a display board with about 20 different items that could be found on campus. Divide your class into groups of threes or fours. Give the class about 2 minutes to memorize what objects are on the display board. Explain to the class that they are to find as many of the objects as possible. For each object brought back that is on the board, the group gets 5 points; for objects not on the board, the group loses 5 points. Remember, only allow students to see the display for 2 minutes. Which group had the best memory? Did the winning group divide up the objects in the display so that each person only had to remember five or six things?

81. TOUCH AND FIND

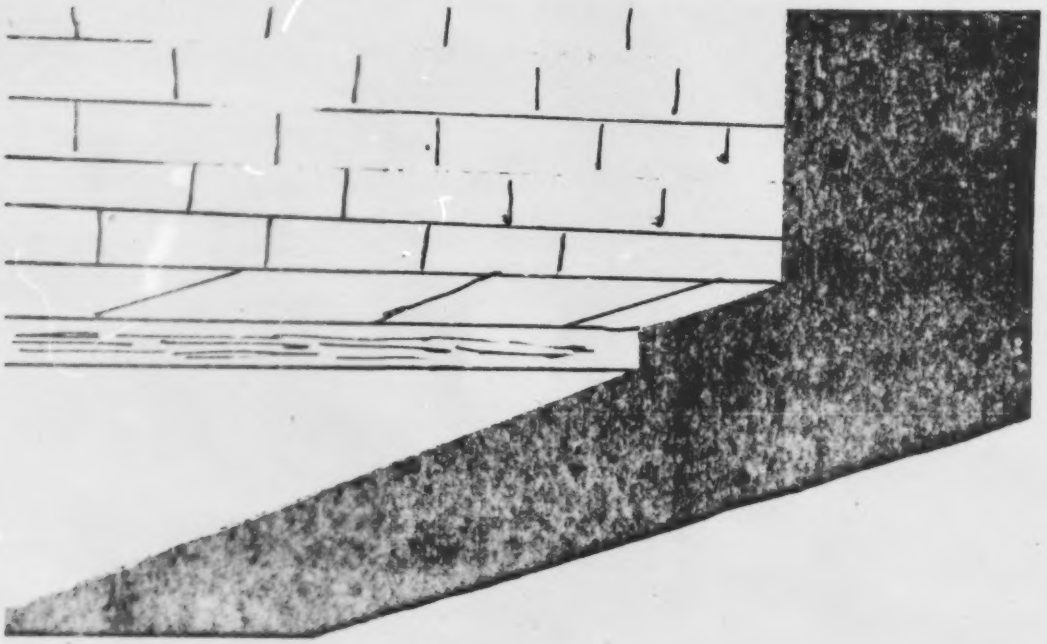
Place several items that can be found on the school campus in a large paper bag. Let each student reach into the bag and touch items. Then instruct the students to go out on campus to find as many of the articles as they can. Be certain no one looks into the bag until after the exercise is completed. Ask students why they had trouble with some of the items and why they found others more easily.

82. TRUE-FALSE CHASE

Divide your class into two large teams. Line up each team so that they face each other and are about 10 feet apart. Designate one team as "TRUE" and one team as "FALSE." Approximately 25 to 30 feet behind each team establish a goal line with string or stakes. You should call out a true-false question. If the answer is true, the true team must turn and run toward their goal line. The false team tries to catch members of the other team. If a capture is made, the captured person must join the other team. Make up a series of questions that relate to subjects currently being studied.

83. SHADOW GAMES

Shadow games help small children to understand both shadows and the sun. Put children in a circle and ask them to make their shadow touch their hand; dance; be very still; stop touching one foot; and stop touching both feet. The children can also try to make a shadow climb a wall, stand on a tree shadow, and make their own shadow disappear.



84. NATURE SCAVENGER HUNT

Compose a nature scavenger hunt for the school ground. Students should work in pairs and lists should be run off for each pair of students. List can be of general nature or follow specific themes such as trees, shells, etc. An example follows of a general list in poetry form.

NATURE SCAVENGER HUNT

Locate a pine tree somewhere in view
A pine cone from here is the first item for you.

Find 1 piece of burnt bark without being shown.
Next find 1 piece of litter and 1 small stone.

You're doing real well, now add 1 reddish leaf.
Next break off 4 thorns without causing you grief.

Find a stick that you think looks like an animal;
Then find 5 small seeds from anything at all.

Collect a piece of Spanish Moss that has fallen to the ground.
Then find a dead leaf that makes a crunching sound.

Find a dead piece of fern that is brown to you and me;
Next pick one green pine needle from a living pine tree.

Bring back one live insect, the best you can borrow.
Search the ground closely and collect 1 small white flower.

Don't give up now, you are almost through;
A feather of a bird is the last item for you.

85. TIN CAN LANGUAGE

Have your students construct several pairs of tin can telephones with long cords. Take two empty cans and punch a small hole in one of the cans. Tie a large knot in the end of the string so that the end cannot be pulled back through the hole in the can. Repeat this procedure for the other can. Have the students divide into groups of four, two students at each end of the telephone. At one end of the line a student should write out a message. His partner should then read the message into the phone. At the other end, one student listens to the message and must repeat it to his partner. This partner copies the message. Pronunciation must be precise to be understood without visual reinforcement of seeing the speaker's mouth. The message should be compared for mistakes.

86. MESSAGE SIGNALING - SEMAPHORE

Students divide in pairs and spread a wide distance apart on the school grounds. Utilizing standard Morse Code, students send messages to one another by use of flag signals. Each student will need a signal flag, which may simply be a stick or ruler with a handkerchief attached. The teacher should transfer the Morse Code (below) to the blackboard and each student make a personal copy. Students should first write out their message placing appropriate codes above each letter. Receiver should observe sender closely with paper and pencil, marking down appropriate dots (with a circle) and dashes. Receiver should mark a vertical line after each letter and a double vertical line after each word.

All letters begin with the flag facing straight forward. A "dot" is made by swinging the flag to the sender's right, then back again. (Remember, the word right has a "dot" over the i.) A "dash" is made by swinging the flag to the left and back. Lift the flag straight up to end a letter. Lower the flag in front of you to end a word.

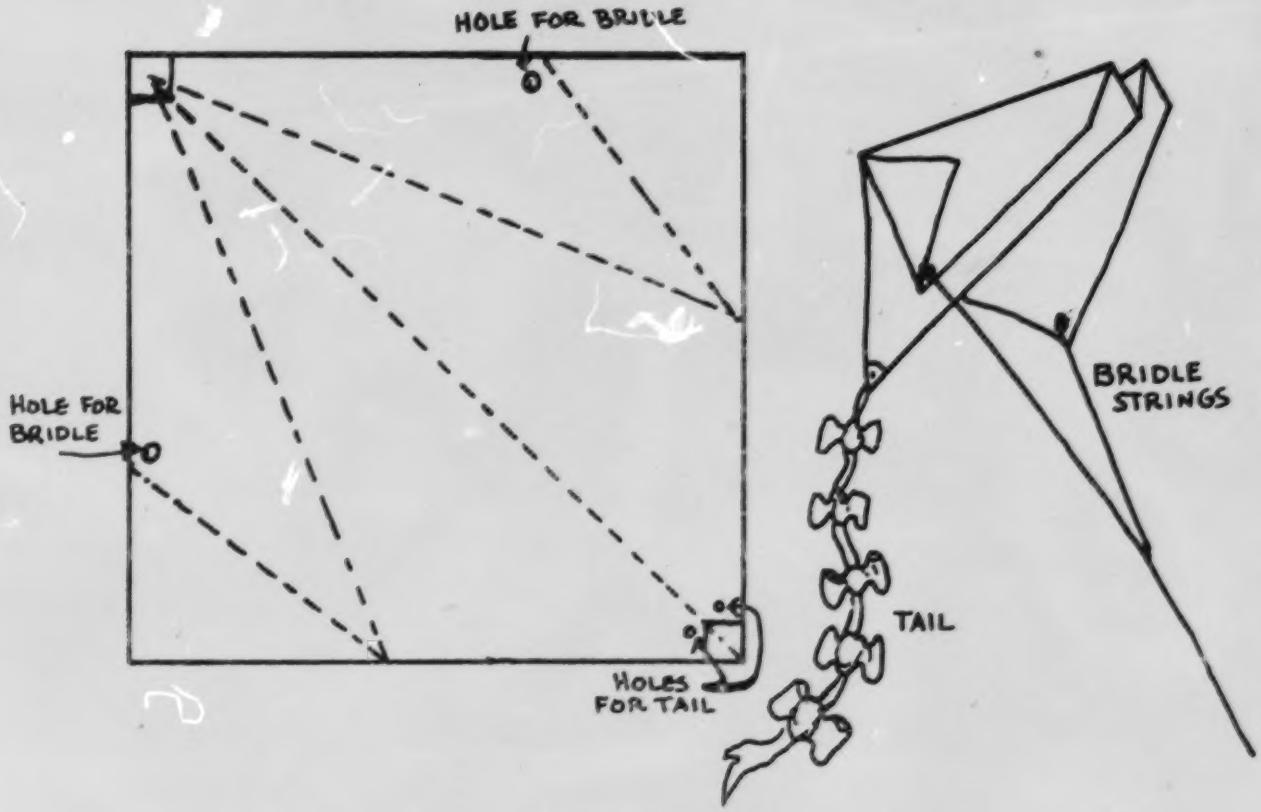
Whirl flag around in a circle quickly to signify a mistake; therefore, you will start the word over. Moving flag quickly from left to right signifies the end of a message. (The most frequent mistake will be from "receivers" mixing up the left with the right.)

THE INTERNATIONAL MORSE CODE

| Letters | Morse Code | Flag Movements |
|---|---|---|
| A | dot-dash | right-left |
| B | dash-dot-dot-dot | left-right-right-right |
| C | dash-dot-dash-dot | left-right-left-right |
| D | dash-dot-dot | left-right-right |
| E | dot | right |
| F | dot-dot-dash-dot | right-right-left-right |
| G | dash-dash-dot | left-left-right |
| H | dot-dot-dot-dot | right-right-right-right |
| I | dot-dot | right-right |
| J | dot-dash-dash-dash | right-left-left-left |
| K | dash-dot-dash | left-right-left |
| L | dot-dash-dot-dot | right-left-right-right |
| M | dash-dash | left-left |
| N | dash-dot | left-right |
| O | dash-dash-dash | left-left-left |
| P | dot-dash-dash-dot | right-left-left-right |
| Q | dash-dash-dot-dash | left-left-right-left |
| R | dot-dash-dot | right-left-right |
| S | dot-dot-dot | right-right-right |
| T | dash | left |
| U | dot-dot-dash | right-right-left |
| V | dot-dot-dot-dash | right-right-right-left |
| W | dot-dash-dash | right-left-left |
| X | dash-dot-dot-dash | left-right-right-left |
| Y | dash-dot-dash-dash | left-right-left-left |
| Z | dash-dash-dot-dot | left-left-right-right |

87. KITES FOR SCIENCE

Have your students construct and fly this simple kite. Discuss the effects of lift and drag as well as other factors concerning flight. How does the angle of the string, mass of the kite, size, length of the tail, stability, etc. affect lift and flight? This kite is made from an 8½ inch X 11 inch sheet of paper and uses sewing thread or fishline to hold the kite. Fold the paper as shown in the diagram. Clip off 3/8 inch from the front and back tips. Attach the bridle strings, flight line, and tail. (The bridle should be attached to either side of the wing with enough slack so that it can pass over the nose easily.) The tail should be 10 to 16 feet long and made of paper, cloth or string but this will vary with wind conditions.



88. COLOR WHEEL

Referring to a color wheel or color mixing chart, students should gather from the school grounds as many examples of coloration (leaves, insects, etc.) as they can locate. Attempt to match the colors of the wheel or chart with the objects discovered.

89. RAINBOWS

When discussing the properties of light and the light spectrum, use the outdoors. Give each group of students a small dish and a mirror. Fill the dish with water and place it near a wall that is in shadow (the sun and wall should be in the same direction from the dish and about 10 to 20 feet away from each other). Place the mirror at an angle, into the water as deep as the dish will permit. Two images should appear on the wall. The upper one will be a bright white reflection of the sun from the part of the mirror above the water. About 10 feet below this bright image, students should find a rainbow of colors. If students have difficulty in locating the colors, tilt the mirror so that the bright area is higher on the wall and the colors should appear. Adjust the mirror until the colors are brightest. Discuss the properties of white light and the effects of a prism. Try different types of liquids (any transparent liquid). What happens to the spectrum? What can this tell us about the liquids? Could this be used to help identify liquids? Discuss "Structural Coloration" in birds - which explains how all blue and green colors in birds are due to the reflection of this spectrum and not true pigment.

90. FLOWER COLORS

Send your students outdoors to find different colored flowers. Students should take only one petal from each flower. Bring the different colored petals back to the classroom. By placing the petals on a white piece of paper, the color can be squished out of the petals by drawing them across the paper. Students should make flower color designs of their choice.

91. TEXTURES IN NATURE

Hold a short discussion concerning textures and how they can be used in art forms. Then take your classes outdoors and have them identify as many different textures as they can locate. They should make sketches of each type. Include things such as different types of tree bark, grass, weeds, sand, different soils, leaves, etc. By getting as close as possible to these items and blocking out extraneous materials, the texture becomes an art form. Have students make charcoal or chalk drawings of their nature texture designs. It is sometimes interesting to put the designs around the room and have the rest of the class guess what the texture is from.

92. NATURE PENS AND BRUSHES

Have your students find materials from the school campus that could be used for pens and brushes. Small twigs, reeds, grasses, pine needles, thistle heads, feathers, burrs, flowers, etc. can all be used to give different effects. Have the students paint designs or pictures with their nature drawing tools. Record what tools were used at the bottom of each painting. Display the paintings in the school library or hallways.

93. DRAW THREE DIFFERENT LEAVES

After students sit beside their trees, instruct them to draw 3 different kinds of leaves that are around them where they are sitting.

94. CLOUD PICTURES

Give each of your students a piece of dark or light blue construction paper and a piece of chalk. Go outdoors and observe clouds. Have students use their imaginations as they look at the clouds. They will see many interesting things formed during their observations. Use the chalk and construction paper to sketch what they are seeing. Construct a bulletin board of cloud pictures.

95. EXAMPLES OF CHANGE

Give students paper and a pencil. Instruct them to go outside and make drawings that will show any of the following: the interdependence of plants and animals; change; man's influence on his environment; a predictable change; a good change or a bad change.

96. LEAF SKELETONS

Have your students collect a few fresh green leaves from the campus. Make a pounding board from a piece of old carpet tacked to a wooden block. Place the leaf on the pounding board veined side down. Hold the leaf firmly with one hand and gently tap the fleshy parts of the leaf with a fine bristled hair or shoe brush. Brushes with animal bristles work better than those with synthetic bristles. Occasionally turn the leaf over and work on the undersides. To preserve leaf skeletons, cement them to dark colored construction paper or cardboard. Label the leaf and cement a pressed specimen of the entire leaf next to the veined skeleton. Art students may wish to paint the skeletons and arrange them in pleasing patterns.

97. LEAF PRINTS

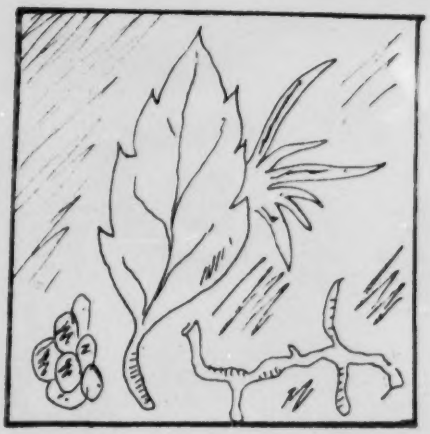
Have your students collect leaves from the campus weeds, trees, and shrubs. Bring the leaves back to the classroom. Apply tempera paints to the bottoms of the collected leaves. Arrange the leaves into pleasing patterns. Place a piece of white paper on top of the leaves and evenly press down. The leaf patterns will transfer to the paper. Spatter prints can also be made. Place leaves on a white piece of paper. Then spatter paints over the leaves and the paper. Use several different colors. Poems can be written about the leaf prints and attached to them. The completed prints and poems can be used to decorate the school.

98. LEAF PLAQUE

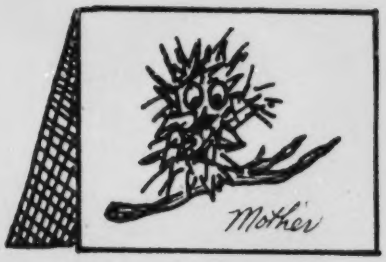
Collect a variety of leaves from the trees, shrubs, and weeds on campus. Prepare a cardboard ring that is approximately one inch wide and large enough to encircle the leaf being cast. Grease the leaf with vaseline and place it vein side up on a piece of newspaper. Tie a piece of heavy string into a loop. Place the string loop into the cardboard ring so that half of the loop is outside the ring. This will allow you to hang the plaster cast on the wall. Now very slowly pour some Plaster of Paris onto the leaf and string loop. Fill the cardboard collar with the plaster. Allow the plaster to dry overnight. Remove the cardboard ring and peel off the leaf. Gently wash the cast with warm soapy water. Paint the cast and the leaf print in contrasting colors.

99. NATURE ART

Students gather items about the school grounds (leaves, twigs, seeds, grasses, etc.) and compose a picture by gluing them onto light cardboard. Themes may be suggested by the teacher or students may be allowed to follow their own imaginations.



100. BEAUTIFUL SANDSPURS



Have your students collect sandspurs from the campus. Glue the sandspurs onto cardboard and then paint designs around them. Glitter can be sprayed on the collage to add highlight. A variation to this activity is to stick the sandspurs together to form spheres. Attach a string to each sphere. Spray paint or spatter paint the sandspurs and then add some glitter. These spheres can be used as Christmas decorations or in mobiles.

101. MOSAIC NATURE PICTURES

Have students collect dried seeds from around the campus. Glue the seeds onto construction paper to produce mosaic pictures of wildlife and environmental scenes. The soft brown shades of the seeds can add to the decor of most homes and classrooms.

102. TRASH COLLAGE

Have your class collect trash from the campus. Allow the students to select pieces of the collected trash and construct a collage. The collage can be mounted on plywood, beaverboard or masonite for a permanent classroom display. The resulting "pop art" can be titled, "Pollution -- Is It Necessary?" Dispose of the rest of the trash in a suitable way.

103. ENERGY COLLAGE

Have students go out on campus and collect 10 objects that either show that energy is being used or was used in their making. Have the students construct a collage of their energy objects.

104. LEAF PICTURES

Have students make leaf pictures or leaf collages. Collect small leaves from different areas of the campus. Allow the leaves to dry in a plant press or between paper towels weighted with bricks or books. Glue the separate leaves onto construction paper to produce wildlife or environmental scenes. A combination of seeds and leaves can also be used. Making a large turkey (with leaves as feathers) becomes an excellent Thanksgiving project.

105. PETAL POINT

Have students produce petal point collages. Collect flowers from around the campus. Separate the petals and place them in a plant press or between paper towels weighted with books or bricks. This will allow the petals to dry, but retain their colors. Glue the petals onto construction paper to produce pictures.

106. NATURE MOBILE

Have your students collect leaves, twigs, and other natural objects from the campus. Construct mobiles from these natural objects. The leaves should be press dried before use. The mobiles can be hung throughout the school before students take them home. Use natural objects or combinations of natural and man-made objects. A Pollution Mobile could also be constructed to demonstrate the differences between beauty and trash.

107. PINE CONE BIRDS

Have students collect pine cones from around the campus. Construct birds from these pine cones by gluing pine cone scales onto thick cardboard to make the wings. Glue the wings onto another pine cone. Add a paper mache head. Paint the head, wings and body. This can be used as a wall hanging or, if a stand is constructed, as a table decoration.

108. PINE CONE OWL

Collect pine cones from the campus grounds. Cut out felt eyes, beak and feet. Glue the eyes, beak and feet in place on the pine cone and, presto, you have a pine cone owl to decorate a table or shelf.

109. ACORN PEOPLE

Have your class go out on the school campus and collect acorns. If oak trees cannot be found on your campus, the children may collect pebbles, pine cones or small sticks. Bring these items back to the classroom and have the students construct models of people. Clothes can be made from leaves. A good, fast-drying glue will help the children during this activity. Faces can be painted onto the "acorn, pebble, or stick people." The models can be used to tell stories or create model towns. If the models are constructed to look like police, firemen, grocery store owners, etc., students can construct a city community.

110. WEED CENTERPIECES

Divide the students into pairs. Have each pair collect different types of on-campus common weeds, expecially those in seed, and make a small table centerpiece. Display the centerpiece in the classroom or school lunchroom. Award a prize for the most attractive centerpiece.

111. LEAF HOLIDAY CARDS

Have your students collect a few leaves from the plants on campus. One leaf or a pattern of leaves can then be placed on a folded piece of construction paper. Place contact paper over the leaves and press down firmly. The contact paper will hold the leaves in place. Appropriate holiday verses can be written on the card before applying the contact paper. Arrange the leaves according to the holiday for which the cards are being made.

112. PAINT A CAN

Trash cans are almost as unsightly as the litter put into them. Divide your class into small groups. Give each group a trash can, some brushes, and paints in several colors. Have a trash can decorating contest. Involve the entire school by letting them vote for the trash can of their choice. Distribute the cans throughout the campus. Allow the students to make a litter survey of the campus. This will help them place the cans in the most needed areas.

113. NATURAL MUSIC

Have your class go outdoors and find objects with which they can make sounds, such as stones, seed pods, sticks, dry grass, etc. Use these objects to play songs. If possible, compose your own music and allow your class to play at a school assembly.

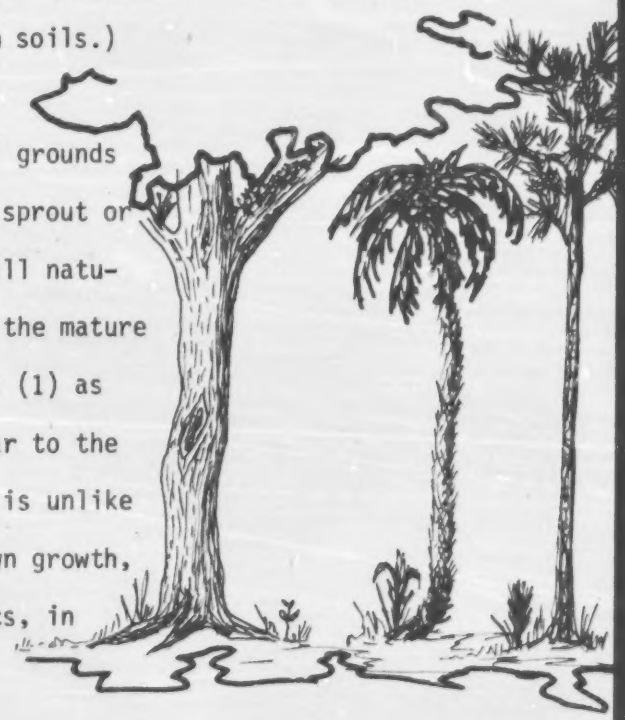
114. INSECTS AND MUSIC

Take the class outside to a weedy area. Students should listen to insect sounds, find the insect and determine how the sound is produced. Then they should determine what instrument most resembles the sound and method of sound production. Have the class compose a song containing these sounds.

115. PLANT REQUIREMENTS

Review the three Basic Life Requirements of plants: Sunlight (food), Water, and Oxygen for roots. Have children take a survey of the areas on the school grounds where plants do not grow. Determine which of the major life requirements for plants is missing. (Bare ground on paths or playground sites can be related to soil compaction, which reduces the necessary amounts of oxygen in the soil. Stress the importance of burrowing organisms and plant roots to loosen and aerate such soils.)

116. TREES AND SEEDLINGS



Examine a mature tree on your school grounds and compare this adult tree with a young sprout or seedling of the same species. Sprouts will naturally be found growing beneath or nearby the mature tree. Ask students to list (or discuss): (1) as many ways the juvenile specimen is similar to the mature tree; (2) as many ways the sprout is unlike the mature tree. Relate this to their own growth, resemblance to their parents, and genetics, in general.

117. PLANT GROWTH MEASUREMENTS.

Have your students place colored thumbtacks exactly 12 inches apart near the center of a weed, tree or shrub branch. Try to pick a plant variety that grows rapidly. Make periodic measurements of the distance between the tacks; from the tack to the trunk; from one tack to the tip of the branch; from one tack to the ground. Where does the most growth take place along the branch? Does the trunk elongate from the ground to the branch? Try this same exercise on a variety of plants or the same plant at different spots on the campus. Are there differences in growth rates in these plants? Why?

118. GROWTH OF LICHENS AND MOSSES

Locate a tree on campus that has either lichens or mosses attached to it. Place tacks around the edges of the lichen or moss patch. How much growth has taken place? If possible, repeat the exercise on different types of lichens or mosses, on different types of trees, on lichens or moss patches that are growing at different compass points.

119. HOW OLD IS A BRANCH?

Have your students determine the age of tree branches on the campus. Starting at the tip of a branch, locate the terminal bud (the last bud on the tip of a twig or branch). Now move along the stem until the first bud scale scar is located. The scar completely encircles the branch and is the point where the last growing season's terminal bud was located. Usually, the distance between the bud scale scar and the terminal bud represents one year's growth. Then continue down the branch toward the tree's trunk to the next bud scale scar. The distance between the bud scale scars is one year's growth. How old is the branch? In what year did the branch grow the most? Do other branches on this tree show the same growth pattern? How often does this tree compare with other trees? What could have caused more growth in one year than in another year?

120. TREE BRANCHES

Divide your class into small groups. Give each group a magnetic compass and the following instructions: Stand beside the trunk of a tree. By using the compass, determine in which directions the main branches of the tree are growing. Record the information as well as the type of tree you are examining. Do more branches grow in one direction? If so, what is that direction? Do other trees of the same type have a branching pattern? Is the branching pattern affected by buildings, other trees, and the prevailing winds?

121. INJURED PLANT GROWTH

Find several of the same type of weed on campus. Plaintains, ragweed, pennywort, lambsquarters, Spanish needles, etc. work well. Have students measure the height of the plant, record the number of branches, and make sketches of the plant. Now have each group remove different leaves or branches from their plant. Tag the plants with waterproof markers so that they can be identified later. Have at least one group remove the terminal bud area of their plant. Make periodic checks on the plant growth. How were the plants affected? Try to repeat the exercise and determine if these changes are predictable or occurred by chance only.

122. REACTIONS OF PLANTS TO LIGHT

Divide your class into groups of fours and fives. Have each group find a small weed or grass plant species on the campus they wish to study. Each group should build a light barrier that will cover their plant species. Since these light barriers will be left outdoors for a few days, they must be waterproof. Cardboard coated with wax or plastic works very well. Secure the light barriers to the ground with bent pieces of coathangers. Cut a window about three inches square in one side of the light barrier. Students should record the position of the plant and its shape before placing the light barrier over the plant. After approximately one week, remove the barriers and record any differences in plant growth. Did all the plants react the same way? Why? What would happen if the light barrier were turned so that the window was in a different position? Would it be possible to get the top of the plant to grow downward?

123. EFFECT OF LIGHT DURATION ON PLANT GROWTH

Have your students determine the effect of light duration on campus weeds. Have each group of students choose a grass or weed for study. Construct light barrier boxes from cardboard covered with wax or plastic. If possible, each group should construct 2 or 3 light barrier boxes. Record the condition of the study plants including length of branches, height of plant, presence of flowers, etc. Label one plant as "Control;" this plant will be left in the light. Place the light barrier box over the other plant. Determine the hour of sunrise for each day during the study periods. Keep the light barrier box over the test plant for one half of the daylight hours each day. If more than one box is used, vary the length of light duration. At the end of 8 to 10 days record the results of plant growth and changes in the plants. Could these plants survive in northern latitudes where the length of the days is shorter?

124. GRASS AND SUNLIGHT

Divide your class into groups of threes or fours. Give each group a piece of wood approximately 12" X 12". Each group should label their wood. The wood blocks should be placed on top of the grass on some area of the campus. Students should check the grass under the blocks every two days. The students can keep a record by using crayons to designate color changes that occur on each day. Discuss why the color changes. What will happen if the blocks are removed after a 10 day period?

125. PLANT RESPIRATION

To demonstrate plant respiration to your students take them outdoors to a tree or shrub on campus. Place a clear plastic bag around the tip of one branch and securely fasten the open end of the bag around the stem. Water drops will form on the inside of the bag. Where does the water come from? Fasten bags to several different plants. Which ones produce the most water from respiration? Which ones would survive best in a dry climate?

126. MEASURING LEAF EVAPORATION

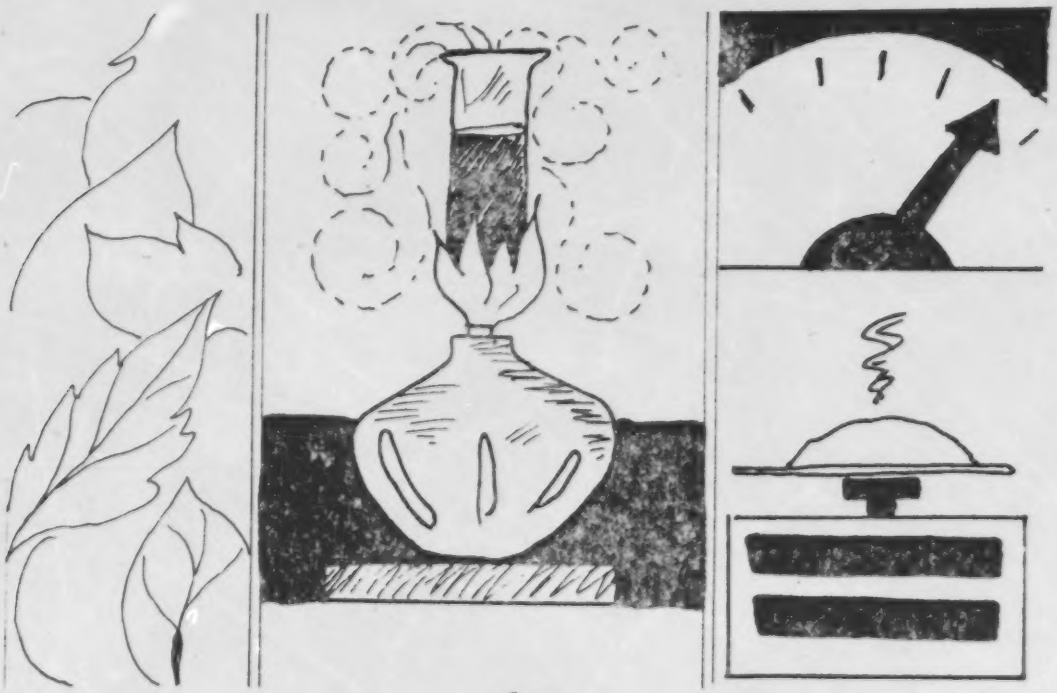
Select a leaf on a tree and make a leaf sandwich of it by placing a layer of saran wrap on the top and bottom of the leaf. Do not remove the leaf from the tree. Between the leaf and saran wrap place a strip of cobalt blue paper. Hold the entire thing together with paper clips. Check the leaf periodically and record the time it takes for the cobalt chloride paper to turn from blue to pink (dry to wet). Try several leaf sandwiches. Compare different species of plants from different micro-communities - dry sites, wet sites, sunny, shade, north side of building (shady side), with south side of building. Record and list the data.

## 127. MINERAL CONTENT OF LEAVES

Have your students determine the percent of mineral content in different leaves from campus plants. During discussions and laboratory experiments concerning plant growth, students learn that plants use carbon dioxide, light energy, water, and soil minerals for growth. Have students collect 100 grams of leaves from each study plant. Also record the number of leaves necessary to make up 100 grams. Cut the leaves into small pieces and place each type in a separate flask. Using a burner, burn the leaves to an ash (if a kiln is available, place the leaves in the kiln for 24 hours at 600°F). Weigh the ash (the ash is the mineral material from the soil that the plant used). Use the following formula to obtain a percentage of mineral content:

$$\text{Percent of Mineral Content} = \frac{\text{Weight of leaves - Weight of ash}}{\text{Weight of leaves}} \times 100$$

Did each species have the same percent of mineral content? What materials made up the most weight in the leaves: minerals or carbon dioxide and water? Calculate the total mineral weight of the leaves on the plant you sampled.



128. WATER DEPENDENCE IN PLANTS

Water makes up a large percentage of plant and animal matter. Plants, like animals, would die off if water were not available to them. A general rule of thumb that can be used in ecological studies is that the percent of water content making up a plant or animal is a measure of water dependence for that organism. Have each group of students select a different area of campus from which to sample plants. Try to include dry areas, wet areas, and areas that show gradations between these extremes. Record on a campus map where the areas were, the relative wetness or dryness, abundance of vegetation, soil types, and types of vegetation. Have the students collect samples from the most abundant plant species from each study site. Place the dishes in a drying oven for 48 hours at 105°C. Weigh the dried sample and subtract the dry weight from the fresh or wet weight. Divide the difference between wet and dry weights by the wet weight. Multiply this answer by 100 to get the percent of water content. Do the plants from the dry areas have more or less water content?

129. PLANT DECOMPOSITION RATES

Have your students determine the rate of leaf decomposition of different campus plant species. Divide the class into small groups. Have each group collect leaves from different species of plants. Dry the leaves at 100°C for 48 hours in a drying oven. Divide each species into 10 gram piles. Place each 10g. pile into a bag made from plastic screen mesh or loosely woven fiberglass. The bag should be large enough so that the leaves do not overlap. Clear an area on the campus so that the leaves in the bags can come in contact with the soil. The bags should be secured in place by pinning the bag to the soil with nails. Another method is to cover the bags with chicken wire and secure the wire to the soil. Prepare 4 bags of each type of leaf. Every 2 weeks remove a bag, dry, and weigh. Keep a graphic record of the results. Which species of leaves decomposes the fastest? Which decomposes the most during the first 2 week period? Can you think of reasons for the differing rates?

130. PLANT PARTS

Take your students out on the campus and have them identify parts of plants. Before going outdoors explain and point out the general plant parts: stems, branches, roots, leaves, and buds. As you walk around the campus, have random students name a plant part. The student must name a plant close at hand and point out the part named. This will help students learn the parts as well as the similarities among plants.

131. FLOWER JIGSAWS

Go out on campus and collect several different weeds. Cut the weeds into parts: stem, leaves, flowers, and seed pods. Place the weed parts in a box and mix them up. Divide your class into small groups and take them for a walk in the areas where you collected the plant parts. Find a shady area and then give each group their box of plant parts. The group that can reassemble the plants in their box wins.

132. SEED AND PLANT MATCH

The teacher should collect seeds from plants found on the campus. Divide the class into groups of four and give each group two or three types of seeds. The students should then go out on campus and locate the plants that produced the seeds. This exercise will increase observation skills. A leaf from each plant can be collected and then the matching seed and leaf can be taped to construction paper to make a bulletin board display.

133. SEEDS AND THEIR DISPERSAL

Have students search the weedy areas of the campus for six different kinds of seeds. Then return and display the seeds, with the teacher leading discussion on what seeds are and how each type of seed is dispersed (e.g. hitch-hiking spiny seeds, wind-dispersed feathery or winged seeds, bird-scattered smooth seeds, etc.). Have students predict what types of plants would be found in different parts of the campus according to dispersal methods.

134. WIND DISPERSED SEEDS

Allow students to make a collection on the school grounds of wind-dispersed seeds. By listing on the board the following man-made forms of air travel: propellers, gliders, rockets, wings, parachutes, balloons, helicopters, make the necessary forms of comparison.

135. WHAT KIND OF PLANTS DO BIRDS DISTRIBUTE?

Stretch a pole, strong wire or rope between two trees or poles. The pole or rope should be about six feet above the ground. Rake and water the soil under the pole or rope. Prepare a similar area without a pole or rope. This area is the control for the experiment. The pole or rope acts as a perch. Seed-eating birds will perch on the rope and the bird droppings will contain seeds. Compare the perch area with the control after a few weeks. Keep both areas watered and tended. Keep track of when the first plants appear. Try to identify the plants and the type of seeds they produce. How did seeds get into the control area?

136. LEAF SIMILARITIES AND DIFFERENCES

Students collect 2 leaves from each of 2 different types of trees. They return to the classroom and individually list the following:

1. As many differences as they can find between the leaves of the two different trees;
2. As many similarities as they can find;
3. As many differences as they can find between the two leaves of the same tree.

(Weeds, insects, shells, etc. can be substituted for leaves.)

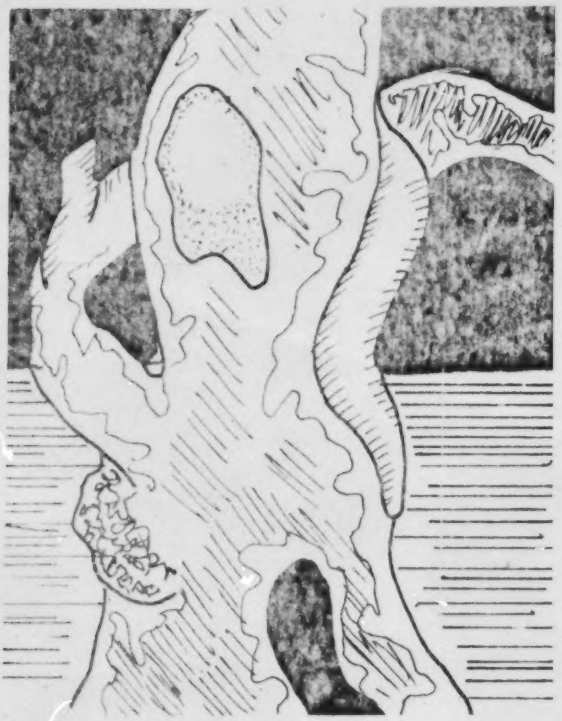
137. MEASURING THE LEAF AREA AND VARIATION OF LEAVES

Pass out graph paper to students. Visiting a weedy area or a tree on campus, students should each collect 1 leaf. All should have a leaf from the same species of tree or weed. With pencil, students trace the outline of their leaf onto the graph paper. Students count all the whole squares inside the outline and the squares which are only partly within the outline. (A more accurate method is to estimate, with the use of decimal points, the percent of partially covered squares enclosed within the leaf tracing.) Teacher should list on the board the class results in numbers of graph units covered by their leaf outline. An average can be computed. Measure the true size of a graph unit and compute the actual size in square inches of the surface area of their leaf. Utilize this data to compute the amount of leaf surface on the entire tree. (If you told them that X amount of oxygen was produced over X period of time per each square inch of leaf surface, how much oxygen would be produced per leaf; per tree in a given day?

138. LAWN PLANT ADAPTATIONS

A study of lawn weeds can be conducted by comparing a lawn before and after mowing. Have students determine which of the lawn weeds seem to be most successful in adapting to being mowed. Which growth forms do the successful weeds take? Find examples of rosettes, creepers, sprawlers.

139. THE SHAPE OF A TREE



Have your students locate various trees on or near your school campus that are oddly shaped. Try to determine what caused the tree to take its present shape. Trees near buildings often curve outwards due to lack of light, or become one-sided. Look for signs of pruning. Some limbs are destroyed by passing trucks and buses. Look for old wounds on the trunk and signs of terminal bud destruction (pine trees usually will have a sharp curve in the trunk due to destruction of a terminal bud). Observe wound areas for signs of rot, and for signs of the bark growing over the wound.

140. STUDY IN VARIATION

Choose a shrub, vine or tree which contains a compound leaf. (A single leaf comprised of numerous small leaflets.) Without picking the leaves, have each student choose several examples, counting the number of leaflets contained on a single leaf. Now the student should compute the average, or mean number of leaflets per leaf. Compare the results of the class sample with the results from individual students. Discuss which result is the most accurate and why. Other variations can be done with the number of flowers on a weed, thorns on a given length of vine, stickers, number of teeth on a leaf margin, etc.

141. POLLEN EXERCISE

Have your students collect pollen from different plants on the campus. Place the pollen from each plant in a separate microscope depression slide. Label each slide with the name or description of the plant and the plant's location on campus. Capture a honeybee and anesthetize it. Gently scrape off the pollen attached to the bee. This pollen should also be placed in a microscope depression slide. Make drawings of the pollen from the bee. Try to include as many types as you can see. Now match the drawings with the pollen from the plants. Try this exercise with several different bees. Which plants seem to attract the bees the most? Which plants the least? Were there any unidentified types of pollen?

142. SPORE PRINTS

Collect mature mushrooms from the cmapus. Coat a sheet of white paper with mucilage or some other slow drying glue. Obtain four toothpicks and tie a heavy knot with string about halfway up each toothpick. Cut the stem of the mushroom off directly below the cap. Stick the toothpicks into the bottom of the cap at four different locations to form legs. The string knots will prevent the cap from sliding downward and the toothpicks will hold the cap above the mucilage coated paper. Place the mushroom cap onto the paper and cover the cap with a bowl or jar. This will prevent air currents from disturbing the spores as they fall from the cap. Let the cap stand for a full day. Remove the bowl or jar and allow the mucilage to dry. Coat the entire paper with a clear spray fixative or clear spray shellac. The prints can be displayed in frames and used as wall hangings or to help identification of the mushrooms.

143. SOIL FUNGI

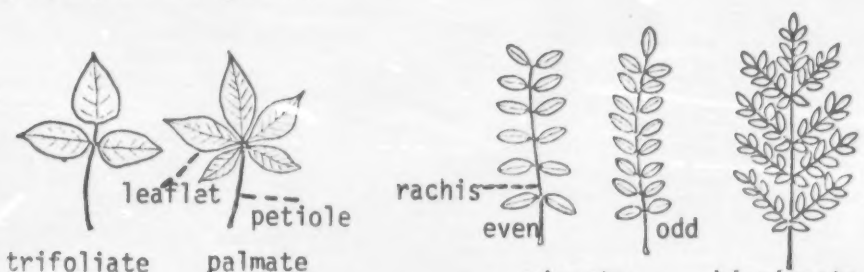
Collect soil samples from different areas of campus. Weigh one gram of soil from each site. Prepare 45ml of sterile nutrient agar with a pH of 5. Divide the agar equally among five test tubes. Cool the agar to approximatley 45°C (cool enough to hold in your hand). Place 1 gram of soil sample in the first test tube. Mix thoroughly. Transfer 1 ml from tube #1 to test tube #2, and then transfer 1 ml from tube #2 to tube #3. Continue this dilution technique until all tubes contain a soil and nutrient agar mixture. Now pour the contents of tube #1 into a sterile petri dish. Repeat this procedure for other tubes. Incubate the petri dishes for 7 days in a warm dark place. The petri dishes now contain the following amounts of soil: Dish #1 has .1 g, dish #2 has .01 g, dish #3 has .001 g, dish #4 has.0001 g, and dish #5 has .00001 g. Count the number of different fungi and make drawings of each. Record color differences. Record the number of fungi for each dilution and calculate the total number per gram of soil. How do the different areas compare? Does the amount of organic matter affect the number of fungi?

144. THE CAMPUS FOREST

Few school grounds have real forests, but most have hedges. A hedge acts in much the same way as a forest. What types of plants grow along the edge of the hedge? Are they the same as those directly under the hedge? Is the soil more moist under the leaves or in areas without leaf litter? Dig into the upper two to three inches of soil; can you see any evidence of decayed leaves in this soil? What are these leaves adding to the soil? Where can the most light be found: outside the hedge, at its edge, or under the hedge? How do these light differences affect what types of plants grow in the area? How do you think a real forest differs from the "hedge forest?"

145. GROUPING LEAF TYPES

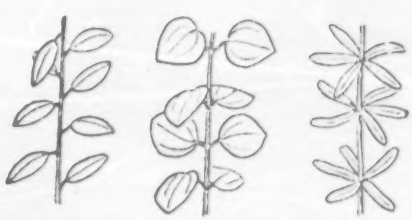
Reproduce the drawings below on handout sheets or have students copy them from drawings on the chalkboard. Ask students to locate on the school grounds trees, shrubs, weeds, or vines which demonstrate a simple leaf or the types of compound leaves in the drawing (or the type of classification being used). As a quiz technique, place specimens of the various leaf types around the room, each at a numbered station. Students proceed from specimen to specimen with their handout sheets and place each in the proper category. This and the related activities to follow prove to be excellent preparatory exercises to making a key to the trees (see activity #294 ). Preparing a scrapbook type of assignment - collecting from their neighborhoods one example of each arrangement, or as many as possible, makes an excellent homework project assignment.



COMPOUND LEAVES

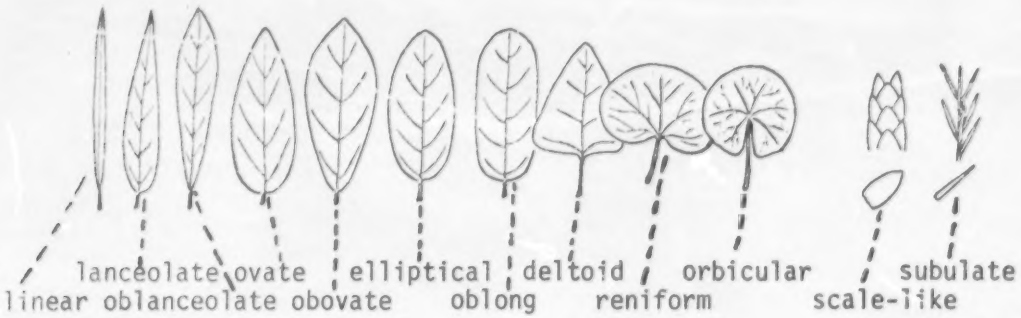
146. GROUPING LEAVES BY THEIR ARRANGEMENT

Following the examples demonstrated in activity # 145, group trees, shrubs, weeds and vines by the arrangement of their leaves on the stem. Use leafless twigs also in your examples. This will necessitate students' looking for the placement of "leaf scars" - the site where the petiole was attached to the stem.



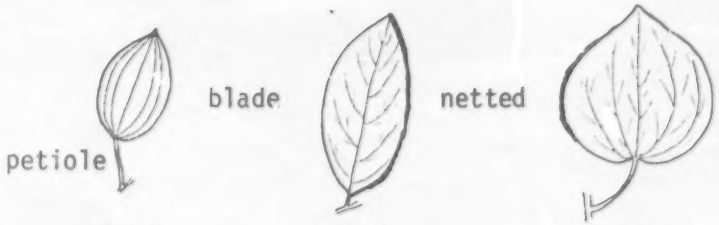
147. GROUPING LEAVES BY THEIR SHAPE

Following the patterns of activity #145, students should classify the leaves of their school grounds according to the shape of the leaf. In the manner of #152, simplify the terminology for younger children.



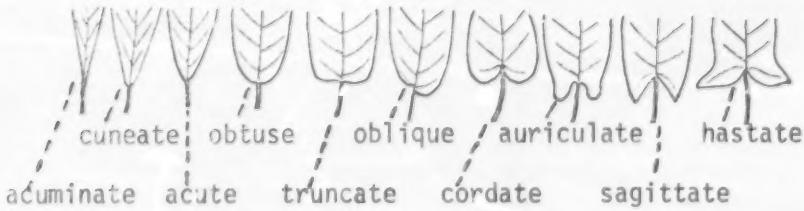

148. GROUPING LEAVES BY THEIR VEINS

Utilizing the three drawings below as described in activity #145, group the leaves of weeds, trees, shrubs, and vines by their venation. Associate the word "palmate," with the palm of your hand and its fingers radiating in different directions. Melaleuca trees are good examples of "parallel" venation.



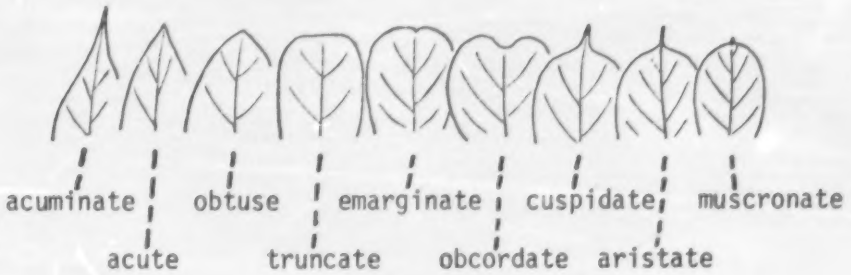

149. GROUPING LEAVES BY THE SHAPE OF THEIR BASES

The examples below demonstrate the different types of bases found on leaves. Utilize these in the manner described in activity #145.



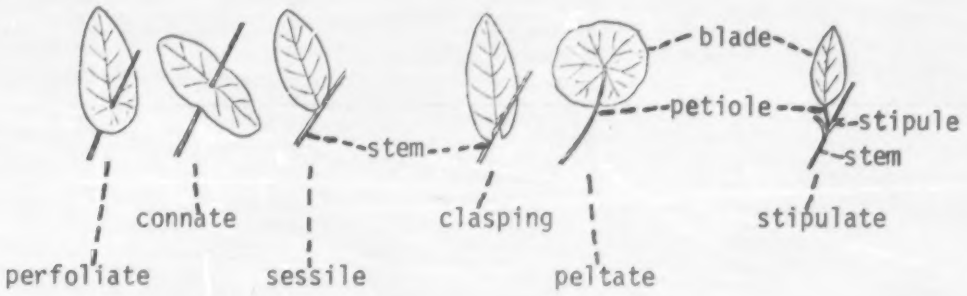
150. CLASSIFYING LEAVES ACCORDING TO THEIR TIPS

Utilizing the drawings below in the activities described in #145, allow students to classify plant leaves according to the shape of their tips. Simplify terminology for younger children.



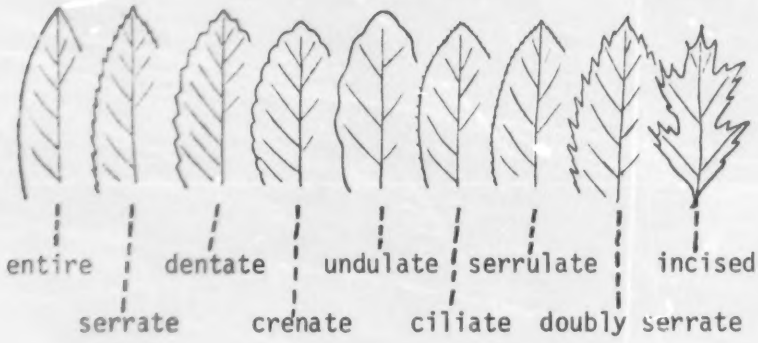

151. CLASSIFICATION OF LEAVES BY ATTACHMENT OF THE LEAF TO THE PETIOLE

This is a miscellaneous grouping system which may be useful when used with the similar preceding activities. The most common arrangement is not shown but is similar to the "sessile," only containing a petiole to form the actual attachment. This could be termed, "simple."



152. CLASSIFYING LEAVES BY THEIR MARGINS

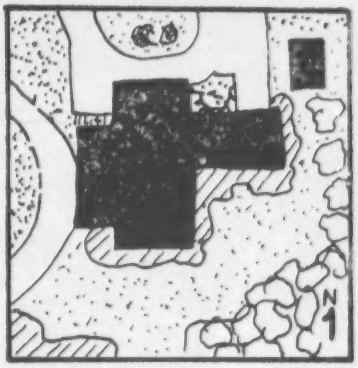
In a similar activity described in #145, students should be able to place any leaf they discover in a category based on the margins of the leaf. For younger children, a simplification of the terminology would be desirable, e.g. entire (smooth), serrate (saw-toothed), dentate (toothed), crenate (lobed), undulate (wavy), ciliate (hairy), serrulate (finely saw toothed), doubly serrate (double saw toothed), incised (irregular saw toothed).




153. PLANT SURVEY

Divide the class in groups. Students conduct and make a survey of all the kinds of plants on the school property. There is no need to identify the plants by name. List may read: four kinds of grass, two kinds of mushrooms, ten kinds of trees, 12 kinds of flowers, etc. Group with the largest number recorded within a given time limit may be declared a winner. Other groups may challenge for proof. Follow up activities may work with identification.

154. PLANT MAPPING




Students create a map of the school grounds showing where different kinds and numbers of plants are growing. Use colored pencils. Attempt to give reasons for the plant distribution as shown on the map, considering such factors as disturbance from machinery, shade, sunlight, soils, moisture, foot travel routes, or any other factors that seem appropriate.

155. MAPPING A TREE TRUNK

Choose and mark with chalk a 1-2 foot high section of a tree trunk on the school grounds. Instruct children to make a map of this strip of tree trunk. Complete the map in sections so that sections could be taped together forming one long roll representing the circumference of the trunk. Bark details can be duplicated by tracing over the paper sheets. Placing the paper roll above or below the area to be mapped and, with the paper oriented, details of plants (a moss, lichens, ferns, air plants, etc.) should be added. Mark any color differences in the trunk. Mark North, South, East, West; through the day define the zones remaining in shade. (The green tint to the shaded portion is due to the presence of the algae, Protococcus. Discuss why the North side remains in the shade and the meaning of the Tropic of Cancer on the globe.

156. TWIG MATCHING

Pass out to the class several small twigs which have been cut from living trees or shrubs on the school grounds. There should be no leaves on the twig. Twigs should be numbered (1-5; 1-10; etc.). In front of the class place a board with a leaf from each of the trees used. Number leaves A-E; A-J; or place name beneath leaf. Do not allow students to study leaf board. Students are directed to a designated portion of campus where the trees occur and are instructed to locate by comparison the trees from which the twigs were cut. After locating a match, a student picks one leaf from the tree to match his twig. Returning to the lead board, students confirm identification and list on paper the proper combination of numbers to letters. Students who locate the most in a given time are declared winners or teacher may grade the number correct as if a test.

157. PLANT CARDS

Provided in the classroom with light cardboard and clear contact paper, students collect a representation of plants, (weeds, ferns, leaves, grasses, etc.). Each species is carefully sealed beneath the contact paper and attempts should be made to obtain their proper identity. The completed product can be placed around the wall or serve as flash cards to familiarize students with local flora. The teacher should practice the technique prior to demonstration. Care need be taken to avoid bubbles of trapped air beneath contact paper. Specimens should last for several years.

158. PLANT GEOGRAPHY

Allow each student to choose two trees on the school campus. The tree should be identified by the student who must research the native or natural range for the trees. This should be presented on a colored range map for each species. Which countries are most represented by their trees on the school grounds? Which countries or areas of the world are not represented? Give reasons for this. Walk over the school ground on a tree walk. Instead of students' giving the name of the tree, they should give the country to which it is native. (Teacher Note: This information is in the booklet, "Key To The Trees of Lee County," available from the Environmental Education Center.)

159. TREE AND HEDGE GEOGRAPHY

Have your students determine the areas of the world from which the trees and hedges on campus originated. Obtain a copy of the booklet, "Key To The Trees of Lee County," available from the Lee County Environmental Education Center. This booklet has a simple key to the trees and tells where the trees originated. Study each country represented on your campus.

160. PLANT STRESS

Students should locate five or more examples on the school ground where man has caused some stress or injury to local plants. Discuss the importance of plants to man as oxygen-producing agents. Older students may wish to consider the effect on plants along driveways or at stop lights, where idling buses and car exhaust cause plant damage from carbon monoxide entering leaf stomata and displacing oxygen. High schools may use infra-red film to recognize plant stress.

## 161. AUTOMOBILES AND TREES

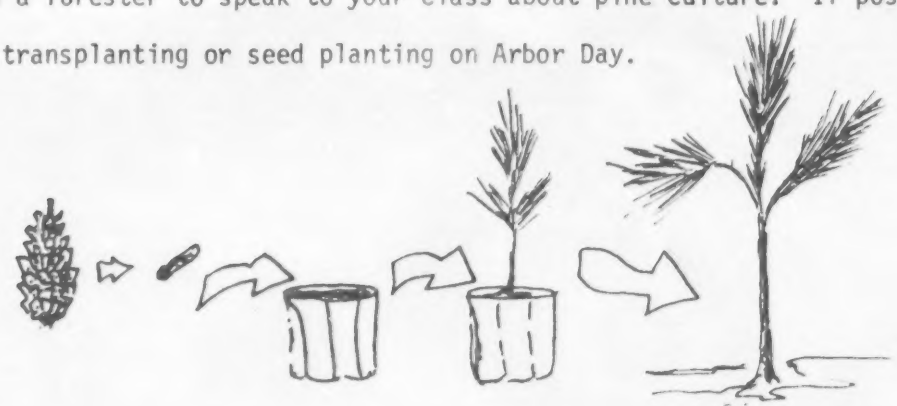
Emphasize with your class how green plants are the only source of oxygen on the earth. For every automobile that emits carbon dioxide into the air, fifty large healthy trees are needed to restore the oxygen that was used. The class should study the school grounds, working in pairs or small groups and count the number of cars in the parking lot versus the number of trees on the school grounds (small trees or shrubs should be counted only as fractions of a "large healthy tree"). Do the school grounds have an oxygen surplus or deficiency? How many more trees would be needed to create an oxygen balance? Discuss the added effect of cars driving past the school. Have students suggest from a map which local areas should have an oxygen surplus to compensate for the reduction in their area.

162. CRACK PLANTS

Take your students outdoors to a sidewalk. Scrape the dirt out of several sidewalk cracks. Place this dirt in a small cup or a depression in an egg carton. Scrape dirt from different cracks along the sidewalks, keeping track of the sample location. Label each pot (cup or carton) with the location from which the dirt was taken. Water the pots and place them in a warm sunny area. When the plants are two to three inches tall, carefully tramsplant them to larger pots or tin cans. More than one plant can be placed in a pot. Be certain to remove any new plants that sprout in these new containers since they are not from the sidewalk crack, but from the new soil in the pot. How many different kinds of plants grew from the seeds in the cracks? Are there any plants from one location that were not found in other areas? Are any plants common to all locations? Try to find plants like those in your pots outdoors near the sidewalks. Look for seeds on these plants and try to determine how the seeds got into the sidewalk cracks.

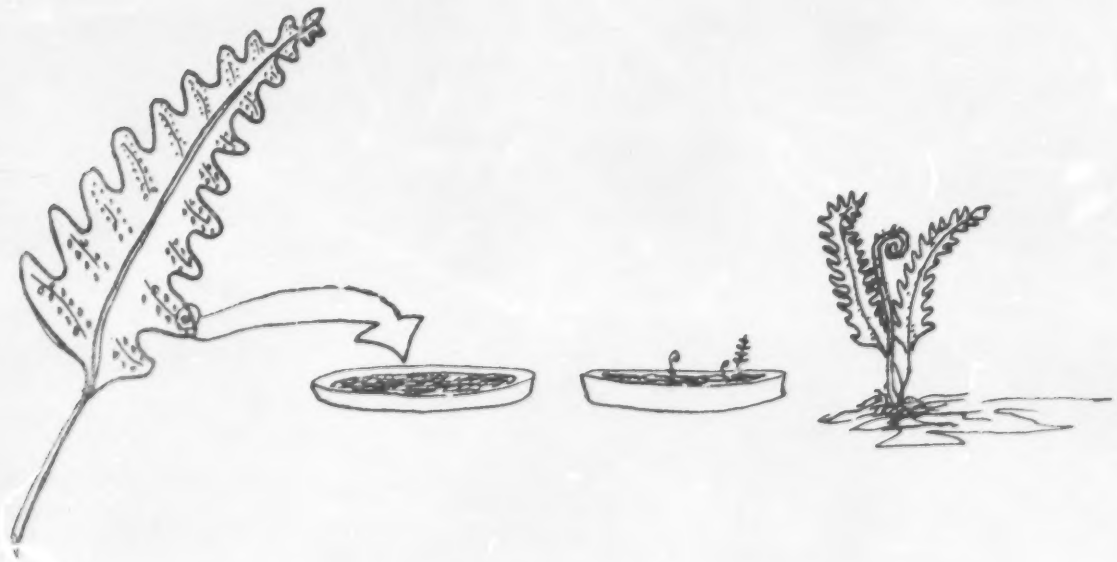
163. PINE NURSERY

Collect pine cones from the campus trees or have students bring in pine cones. Remove the pine seeds from the cones. Prepare a soil bed and plant the seeds. Transplant the young trees to different areas of the campus. Invite a forester to speak to your class about pine culture. If possible, do the transplanting or seed planting on Arbor Day.



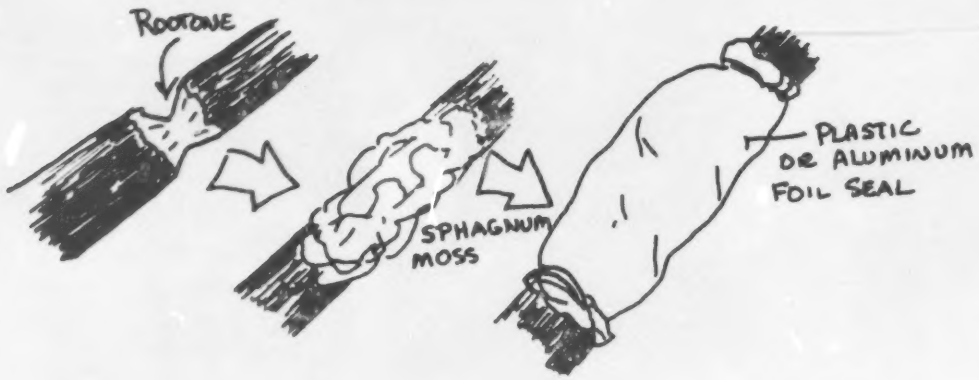
164. FERN GARDENS FROM SCRATCH

Have your students bring in fern fronds with sporangia on them. Try to get as many different types as possible. For each species of fern brought in, use the following procedure: Fill a flat pot saucer half full with small pebbles. Cover the pebbles with a mixture of sand and leaf mold. Cover this mixture with a thin layer of fine sand. Sterilize the pot saucer and its contents in an oven at high heat for 15 minutes or autoclave at 15 p.s.i. (pounds per square inch) for 15 minutes. Allow to cool, and cover with a piece of glass. After cooling, add water until the soil and sand are moist. Then sprinkle spores from the fern frond thinly over the surface. Replace the glass cover and incubate in a warm shaded spot. In a few weeks microscopic heart-shaped prothallia will appear. In another week or so, small fronds will be seen. When the plants are about one inch tall, transplant them to a seed flat. After a few weeks transplant the ferns to a fern garden area outdoors. This area should have plenty of decayed leaves and sticks mixed in with the soil.



165. AIR LAYERING PLANTS

Have your students pick trees and shrubs on campus to air layer. Air layering is a simple procedure of plant propagation. You will need a sharp knife, some sphagnum moss (obtainable from garden supply or nursery stores) and some aluminum foil. Cut a wide "V" shaped notch in the plant stem about one third of the stem thickness. A commercial product, called "Rootone," can be applied to the open cut. This will facilitate the production of roots. Surround the notch with well moistened sphagnum moss. Cover the moss with aluminum foil. Twist the foil tightly around the moss and stem so that moisture cannot escape. Allow the plant to remain this way for at least one month before checking for roots. At the end of approximately one month, gently unwrap the foil. If roots are not present, moisten the sphagnum moss and re-wrap the foil. If roots are present, remove the foil and carefully cut the new plant from the parent plant. Put the new plant in the desired spot on campus. Be certain to dig a large hole for the plant. It is a good idea to add fertilizer and peat moss to the soil before planting. The following list contains some common trees and shrubs that can be air layered: Strangler fig, Cuban laurel, Banyan, Waxmyrtle, Bottle brush, Gumbo limbo, Podocarpus, Powder puff, Rubber tree, Pittosporum, Umbrella tree or Schefflera, Hibiscus, Frangipani, and Azalea. Hardwood trees, such as Maples and Oaks, cannot be air layered.



166. BOARD FEET IN A TREE

Take your class out on campus and determine the number of board feet of wood contained in campus trees. Determine the height of the tree from the ground to a point near the top where the tree is about 8 inches in diameter. (There are several exercises in this booklet that deal with estimating tree height.) Determine the diameter of the tree trunk four and one half feet above ground (Diameter Breast Height). Next, determine the number of logs in the tree. A log is a section of the tree that is 16 feet long. Trees are cut into logs in order to haul them to the saw mill. To find the number of logs, divide the height of the tree by 16 feet. Finally, put your data into the chart to obtain the number of board feet. Remember, a board foot is a board 12 inches long by 12 inches wide by 1 inch thick.

| Diameter in inches | Number of 16' logs 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| 12 | 62 | 80 | 133 | 183 | 235 | 286 | | |
| 14 | 64 | 88 | 147 | 210 | 274 | 338 | | |
| 16 | 67 | 96 | 163 | 242 | 320 | 399 | | |
| 18 | 71 | 109 | 190 | 280 | 370 | 459 | 550 | 701 |
| 20 | 75 | 123 | 221 | 330 | 435 | 543 | 651 | 758 |
| 22 | | | 258 | 383 | 509 | 63[illegible] | 760 | 884 |
| 24 | | | | 438 | 584 | 728 | 882 | 1035 |
| 26 | | | | | 666 | 832 | 1013 | 1190 |
| 28 | | | | | 750 | 941 | 1114 | 1346 |
| 30 | | | | | 850 | 1062 | 1291 | 1518 |
| 32 | | | | | | 1195 | 1149 | 1700 |
| 34 | | | | | | 1333 | 1614 | 1898 |
| 36 | | | | | | 1494 | 1782 | 2095 |
| 38 | | | | | | | 1955 | 2305 |
| 40 | | | | | | | 2150 | 2523 |

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166. (Continued from previous page) BOARD FEET IN A TREE

How many board feet are in all the trees measured? How many picnic tables could be constructed from the campus trees? (First determine the number of board feet in a picnic table.) Are these trees more valuable left where they are or as lumber? Why?

167. WHO LIVES UNDER WHAT?

Have your class wander around the campus locating such things as rocks, boards, bricks, and other articles resting on the ground. The students should try to answer the following questions. How do environmental factors differ between the area around the objects on the ground, and under the object? (Light, heat, moisture, protection for animals, etc.) How are the animals under the object adapted for this habitat? (Many are flat, some burrow in the soil.) How did the animals respond when the object was moved? What would happen if the object were left overturned? Why is it important to return the object to its original position? Thermometers can be used to determine differences in temperature. To check moisture differences, use the sense of touch.

168. SEARCHING BENEATH BOARDS

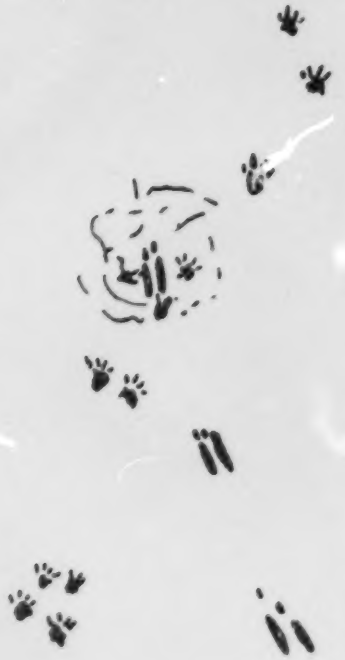
Make a study of the creatures under a piece of board or scrap cardboard. Be sure to return the board afterwards so as to preserve the habitat. How many different types of animals can you find? What reasons can the students give for the insects' living there? Make a chart showing population counts under the same board. Make a census once a week to compare numbers. Make up descriptive names for the creatures you find.

169. CAMPUS HOME WALK

Take your class outdoors. Have them wander over the campus in search of animal homes. List the types of homes found and mark their locations on a campus map. Return to these areas after a rainstorm and at different times of the year to look for differences.

170. SIMPLE HOMES FOR ANIMALS

Allow your students to place stones, logs, pieces of tile and boards on the ground in different areas of the campus. Students should keep a record of how long it takes before animals can be found under the articles. Are more animals found under the "homes" placed in the sun or the shade? Why are the animals shaped the way they are? What do the animals feed on?



171. TRACK STORIES

Allow children to discover "track stories" in the sand or mud. Search closely for the trails and tracks of insects, mammals and birds. Students should attempt to draw as many conclusions as possible from the tracks. What made them? What was the animal doing? Why was it there? How large was the animal? How many animals were there? Was it moving fast or slow? Attempt to find a track story involving two different animals.

172. RECORDING TRACKS WITH SMOKED PAPER

An interesting way to record the tracks of animal visitors is to prepare several pieces of smoked paper. To make smoked paper hold regular paper, shelf paper or poster paper, over a burning candle. The paper will collect carbon from the smoke and anything that touches the surface will be marked. Use a bait station on the ground filled with food items the students suggest. Place sheets encircling bait at several places around the school grounds. Children should make as many deductions as they can about the animals which made their marks.

173. RECORDING ANIMAL SOUNDS

If the school has a tape recorder, use it to record singing crickets, grasshoppers or birds. Combine this with a study unit on animal sounds. Stress the purpose and mechanics of animal communications.

174. NATURAL COLORATION AND SURVIVAL

Purchase or color toothpicks in the following pattern: 100 red, 100 green, 100 yellow, 100 blue; leave 100 with their natural color. Take your class outdoors to a grassy spot and mark off a one square meter area. Spread the toothpicks evenly throughout the area. Give a pair of students the following instructions: You are a toothpick-eating bird. You have two minutes to capture toothpicks. You can use only one hand; place your other hand in your pocket or behind your back.

Allow 4 or 5 pairs of students to try the exercise. Replace the "captured" toothpicks after each trial. Keep a record of the number of each color captured for each trial. Make a bar graph to show the results. Which color was caught the least number of times; the most? Why? Discuss protective coloration. What would happen if a different background were used; for example, dry leaves, sand, etc.?

As a twist to this activity, place a tight rubber band around the thumb and index fingers of one of the "birds." How does this affect captures? Are

(Continued on following page.)

174. (Continued from previous page) NATURAL COLORATION AND SURVIVAL

some "birds" better adapted for hunting toothpicks than others? An eye patch over one eye can also bring some interesting results.

175. FOOD AND ANIMALS

Choose a Brazilian Pepper tree (a female with fruit), a Live Oak with available acorns, a grass that has gone to seed, or any plant which seems to contain food. Through an acceptable sampling technique and the use of a balance, calculate the weight of food (seeds, berries, etc.) on a given portion of the tree or plant. (Be certain to measure only food portions, i.e. not the seed at the center of the fruit, the shell of the acorn, or the wing or husk of a seed.) Estimate the food available on the entire tree or plant. Next, choose a given wildlife species known to feed upon the food. As best you can, estimate the weight of the animal and its daily food weight requirement. (Example: Gray Squirrel-16 oz., daily food requirement-3 oz., the Shrew-weight-2 oz.→4 oz.; the Mockingbird-weight-4oz.→4 oz.) Problem: For how long a period could the tree or plant support a given species of wildlife? Ten of that species? Fifty? One hundred? Present the problem in worksheet form. How many trees would be required to support X number of that wildlife species?

176. SCAT BOARDS

Many of the animals living on or near the school campus are nocturnal. Evidence of their presence may be seen by placing baited scat boards in different areas of the campus. A scat board is simply a six-to-twelve inch square of plywood or tile used to observe animal droppings. Place a small amount of rolled oats and peanut butter mixture on the boards as bait so that the animal will stay long enough to deposit droppings. If the area around the scat board is sandy or dusty, animal tracks can also be found. (See #171 and #172 Tracking.) Unbaited scat boards can also be used. Compare baited to un-baited boards. Which areas of the campus show the most evidence of animal activity? Examine the droppings for seeds and parts of other animals that may have been eaten.

177. DECOMPOSITION OF ANIMALS

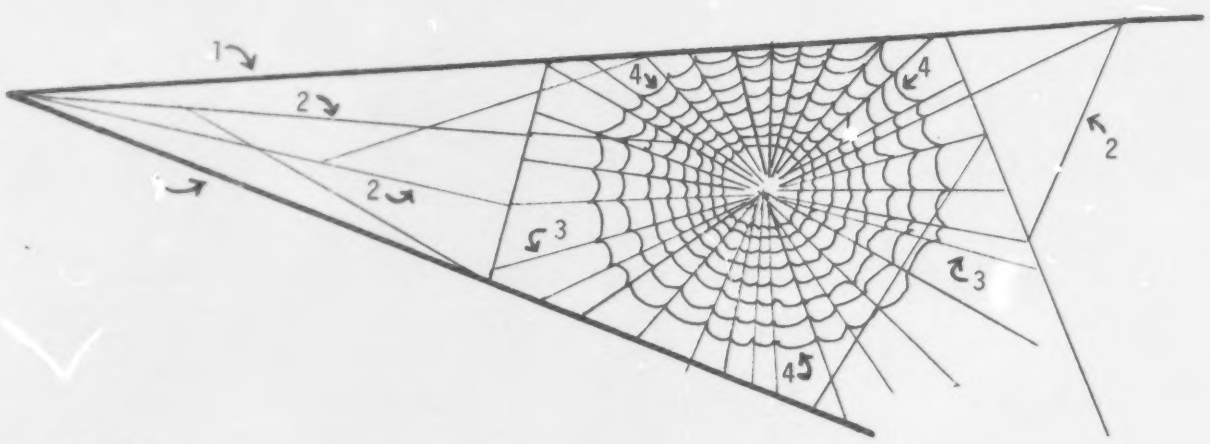
Have your students determine the rate of decomposition of dead animal materials by two different types of decomposers. This activity will demonstrate the significance of large and small decomposers in mineral recycling. Build two small cages large enough so that each one can hold a 1000 gram dead animal or piece of meat. One of the cages should be covered with one half inch mesh hardware cloth; the other cage should be covered with 14 X 18 mesh screen (window screening). Build a tray covered with loose fiberglass or nylon screening cloth inside each cage. The dead animal or the meat should rest on the tray so that the meat is in contact with the soil. The animal or meat can be weighed each day by attaching a spring balance to the tray. Keep a record of the weight loss or gain in each cage. The larger mesh allows large insects and flies into the cage. In which cage did decomposition occur faster? In which cage did more decomposition occur in the first five days?

178. SOIL ORGANISMS

Have groups of your students construct Berlese funnels (see drawing). Go out on campus and collect top soil and leaf litter from different areas of the campus. Keep a record of where the samples come from. Place a piece of ¼ inch screen in the funnel; this will prevent the soil and leaf litter from falling through. The tin foil shade will direct heat from the light bulb onto the soil. As the soil dries, the insects and other organisms will dig downward and eventually fall into the jar of preservative. Allow the apparatus to stand for 24 hours. Examine the soil animals. Count the number of different types from each area. Why were there differences? What do you think most of these animals eat? How do they help form soil?

179. SPIDER WEBS

Utilizing a blackboard, draw a generalized spider web using 4 different colored pieces of chalk to differentiate the 4 principal parts of a spider web. (1) Cables (which support the web by attachments to nearby objects). (2) Roadways (which provide transportation routes for the spider to and from the center of a web and transmit vibrations of struggling insects to the waiting spider). (3) Spokes of the web (like the spokes of a wheel, the spokes give support to the web, spacing the threads and providing points of attachment). (4) Sticky threads (which actually catch the insects). Walk around the school grounds and building searching for spider webs. Have children distinguish the four portions of web. Throw an insect (fly) into the web. Notice which roadways the spider uses to approach the insect.




180. SPIDERS

Have the class capture insects such as flies or small grasshoppers and throw them into a spider's web. The class should make detailed notes step by step of the actions of the spider. (e.g. (1) Spider remains immobile, yet movement of feet seems to indicate an awareness of the trapped prey; (2) Spider begins to advance slowly in the direction of trapped prey, which is continually struggling, etc.) Activity works best dividing into small teams or pairs observing several webs. Comparing results, what similarities of behavior existed? What differences were brought up?

181. CAPTURING SPIDER WEBS

Go out on campus and locate a spider web. Gently remove the spider from the web. Spray the web with white enamel spray paint; use a good quality paint. Cut a piece of black construction paper slightly larger than the web. Spray the paper with a clear drying fixative spray or clear enamel spray until the paper is wet. Gently place the wet paper against the painted web. Next cut the web from the objects to which it was attached. Display the captured webs in the classroom.

Make a study of spider webs. Each kind of web indicates a different kind of spider.

182. INSECT CENSUS

Compute a census of the population of selected insects on the school grounds. Compare a grid system of the school grounds and collect data from a random grid sample. (1) Count numbers of mole cricket runs on ground. (2) Count antlion funnels in sand. (3) Count ants. (4) Number of mosquito larvae on water surfaces, etc. In which types of habitat (grassy, sunny, open, wet, damp, etc.) are each of the animal types most abundant?

183. WHERE DO THE INSECTS LIVE?

Obtain several sheets of fly paper or paint a mixture of ferrented fruit and molasses on cardboard sheets. The students should choose as many different areas on campus as possible to place their sticky traps. Whenever possible, one trap should be placed directly on the ground and another trap several feet above the ground. Were more crawling or flying insects caught? Were more insects caught under trees, in the open, in weed areas, etc.? If possible, place the sheets outdoors on sunny days and then again on moist overcast days. Also compare night captures to daytime captures.

184. INSECT DIVERSITY

The diversity of insects can illustrate the principle of low diversity in harsh or new environments. Have your students pick two different areas on campus. One of these areas may be in a recovery stage from construction or grass cutting. Take at least 10 samples of 250 strokes each in both areas with insect nets. Place the specimens in killing jars and then sort them. The sorting should be made to the species level, but identification is not important. Simply separate by characteristics. Keep a record of the number of species and the total number of individuals. Place the data into the following formula:

$$\text{Insect Diversity} = \frac{\text{Total number of species}}{\sqrt{\text{Total number of individuals}}}$$

Which area had the biggest diversity and why? Try to give reasons for differences in the species diversity, remembering that a larger diversity of insects would probably indicate a larger plant diversity also.

185. INSECT BEHAVIOR - KINEKINETIC VERSUS ORTHOKINETIC

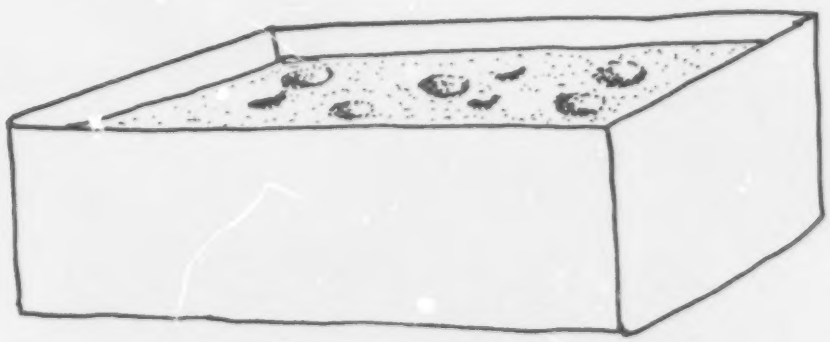
Insects under stress are said to typically exhibit one or two forms of behavior: (1) Kinekinetic behavior (which is simply a speed increase); (2) Orthokinetic behavior (which is simply a greater amount of turning). Students should work in pairs with a sheet of paper with two columns for each of the terms, which can easily be simplified. Testing a variety of insects in the field and placing them under stress by gently touching them with pencil or fingers, students should record on their work sheet the form of behavior (one of both) that was demonstrated by the insect. A wide range of insects should be tested (ants, spiders, centipedes, beetles, crickets, etc.). Class should compare their results and attempt to show predictable patterns of behavior for various insects.

186. INSECT MOVEMENTS

Go out on campus and have your students collect several different types of insects. Place each type of insect in a different shoe box. Cover the tops of the boxes with clear plastic, glass, or saran wrap so that the insects can be seen. Have the class observe the way the animals move. How do they use their legs? Are the legs or body parts adapted to any specific forms of movement? How does the insect's movement help it survive?

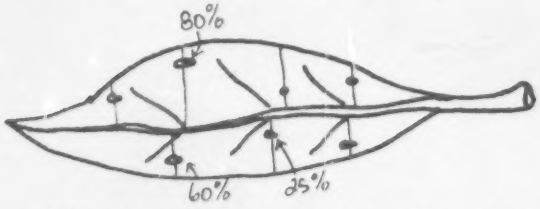
187. POPULATION PROBLEMS WITH ANT LIONS

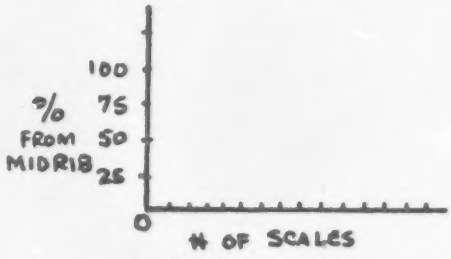
Line a shoebox with aluminum foil or plastic. Fill the box with dry sand. Have your students capture 10 ant lions from dry areas around the campus. Place the ant lions in the shoebox environment and allow them to build their cones. Add a few ants as food. After a day or two, add 10 more ant lions. Continue adding ant lions. Provide an abundance of food to the ant lions. Keep a data record of the original cone diameters and the changes that take place in cone size. Discuss the concept of territory and similar effects in human populations. What happens when the food source is diminished?



188. LEAF SCALE INSECTS

Take your students outdoors and have them examine trees, shrubs, and weeds for signs of insect scales and galls. Students should work with a partner. The groups should estimate the distance from the leaf midrib to each scale gall on the leaf. This distance should be represented by a percent of the distance from midrib to the edge of the leaf. Also keep track of the number of scales or galls.

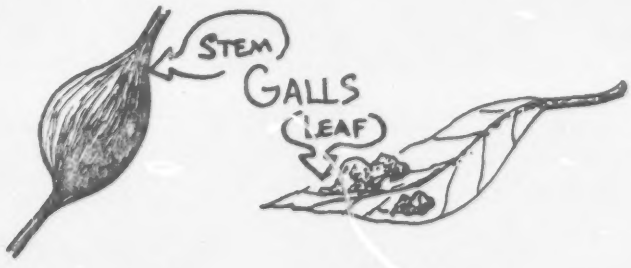



Accurate data records are important. An example of the gall or scale should be kept with each set of data so that different sets of data can be compared. Construct a graph representation of the data (see drawing above). Discuss the results. In many cases a bell shaped curve will be found; this shows a random positioning of the scales. In some cases, the graph results will be skewed to the left or the right. This indicates that the insects are positioning the scales in a specific fashion and not in a random way.

189. WHO'S IN THE GALL?

Have your students collect insect galls from plants living on the campus. Place each type of gall in a separate cage. Make a drawing of the gall and the type of plant on which the gall was found. Make drawings of the insects that come from the galls. What type of food do you think each developing insect will need?



190. MOSQUITO CONTROL

Study the mosquito's life history, breeding habits, and effect on man. Then go out on campus and look for actual and potential breeding sites. How can these areas be changed to prevent mosquito production? If possible, collect a few mosquito larvae and examine them under microscopes. Also set up two study jars containing larvae. Put oil on the water in one and leave the other alone. What happens?

191. LEAF MINERS

Look for signs of leaf miners, insect larvae that live between the top and bottom layers of leaves. A winding trail will be visible on the leaves of weeds where miners have eaten. The trail will be most narrow where the larvae initially hatched and will widen as testimony of the insect's growth until it emerges at the widest point of the trail. Any weedy area should have abundant examples. Ask children to find an example of a leaf miner trail. Trace the trail to show where the insect began and where it emerged. What types of weeds do they prefer? What would be the advantage of living inside a leaf? Allow students to draw what they believe the animal looks like. Discuss the advantage and adaptations of this life style.

192. MOLE CRICKETS

Find a moist area on campus and locate mole cricket burrows. Measure the length of several burrows. Determine the average length of the burrows. Dig up one or two mole crickets. How many toes does each animal have? (The number of toes is one of the characteristics used to identify the species.) Examine the feet under a hand lens. How are they adapted for the life style of this insect? Do you think this insect has good eyesight? Develop an experiment that would prove or disprove your hypothesis about the mole crickets' eyesight. On what does the mole cricket feed? (Dissect out the intestine, stomach, and crop and examine contents with a hand lens.)

193. TEMPERATURE BY THE CRICKETS

Naturalists have discovered that the warmer the temperature, the faster the crickets sing away. On cold days crickets chirp much more slowly. Search the school ground and listen for the sounds of crickets beneath boards and stones and keep them temporarily in the classroom. Using a watch with a second hand, single out one cricket. Count the number of chirps he makes within 15 seconds. Add the number, 38, to the total. The count you obtain will be close to the official temperature.

194. NAMING ANTS

Make a study of ant colonies. How many kinds of ants can you find? Give them descriptive names like mini-reds, two-tones, or pyramid builders.

195. ANTHILL ACTIVITY

Go outside and observe the activity around an anthill. Are ants carrying food? What kind? Do they pay attention to each other? Sometimes when an ant colony is disturbed, the eggs, larvae, and pupae can be seen. Watch nurse ants pick up mouthfuls of tiny white eggs, slender glistening ant grubs, or ant pupae, and carry them to safety. Some ants pupate in a papery cocoon. Others have a naked pupa which looks like a white, inactive ant with all parts formed, including legs.

196. ANT FOOD PREFERENCE

Students should divide into teams, each team choosing a separate ant colony. Place a small portion of several different foods in the vicinity of each colony: (1) cheese (2) bread (3) 40-50 grains of sugar (4) chocolate (5) dead insect (6) meat, etc. Each team should make the following notes: A. Time it took for ants to locate the food - each type; B. Action of the ants once they located food; C. Which of the items was their favorite food. Teams compare notes in the classroom.

197. ANT TRACKING

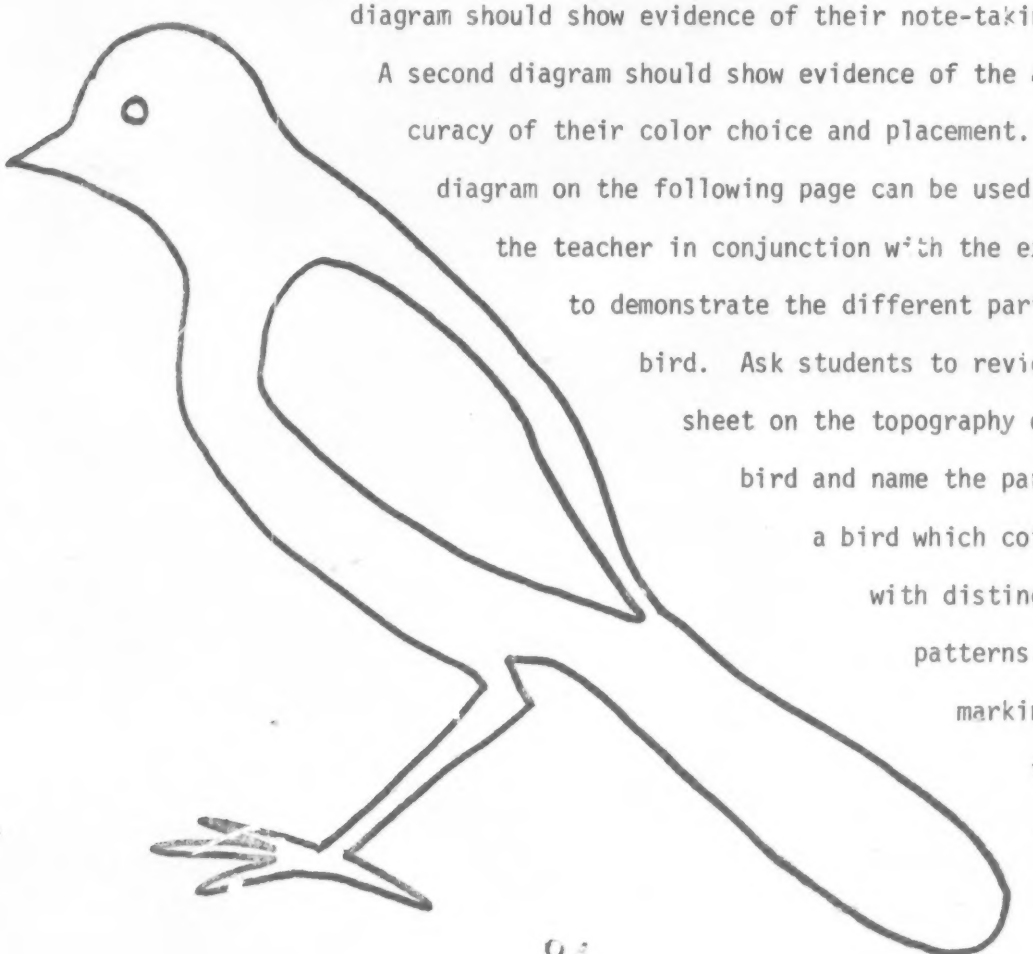
Each student receives a piece of chalk and scrapes the chalk on the side of a plastic spoon or other item to obtain a small quantity of chalk dust. Students scatter over a wide portion of ground - each child locating an ant and marking the ant by pouring chalk dust on it. On hands and knees, follow your marked ant making note of its path by placing tiny markers (bits of gravel, lima beans, stuck-in toothpicks, chalk marks on blacktop, etc.) behind it every 6 inches or so. Follow the ant for some distance. Now review the trail and sketch the trail design on a piece of paper. Repeat activity, marking another ant in the same place as the first. Is there any pattern to the ant's movement? Compare your first to your second ant. Consider the class results. Compare trail sketches. Place broken pieces of bread prior to class and trace ants to their burrow. Utilize different colored chalk. Disturb the ant as little as possible as you pursue him - try not to alter his natural behavior. This is naturally adaptable for other insect or spider studies, beetles, jumping spiders, roaches, crickets, etc.

198. ANT COLONIES

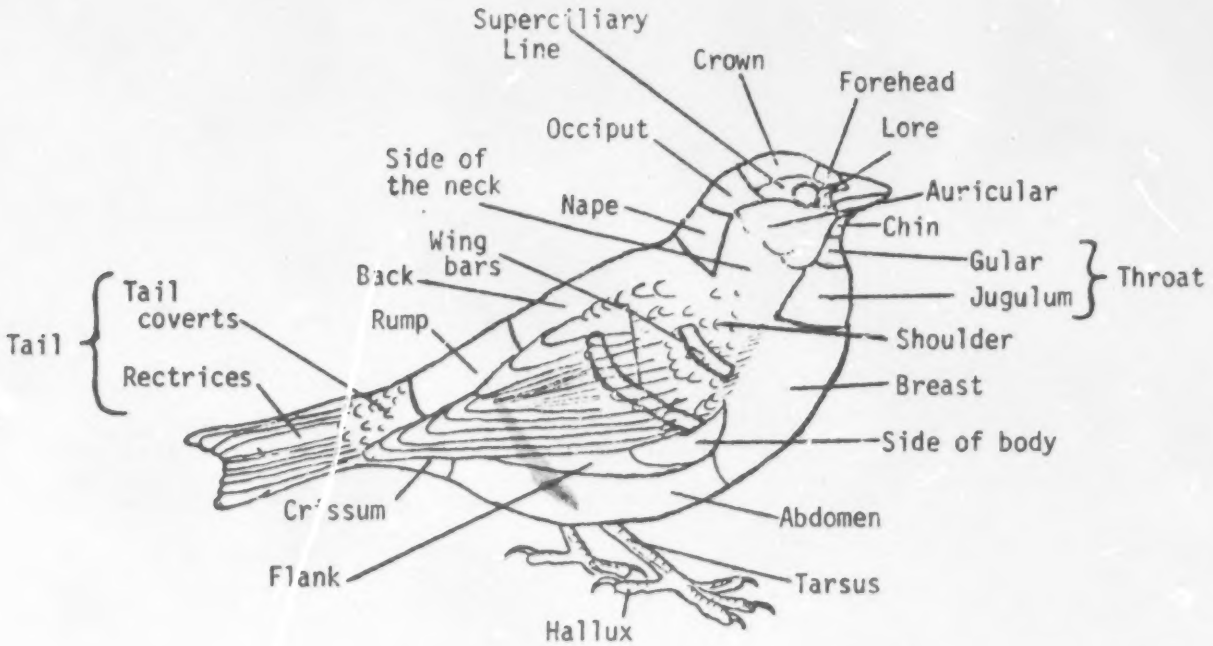
Utilizing the marking skills described in activity #197, locate a few separate ant colonies as close together as possible and douse each colony heavily with a different color of chalk dust. Divide students into teams to compare the movements of each colony, their interrelationships, etc. Present students with worksheets to fill in answers. What movement patterns exist within your colony? Do the ranges of your ants overlap the ranges of other colonies? What is the greatest distance a marked ant has traveled from the colony? Do the ants have specific rates of movement? Do the ants coming from one hole ever enter another hole?

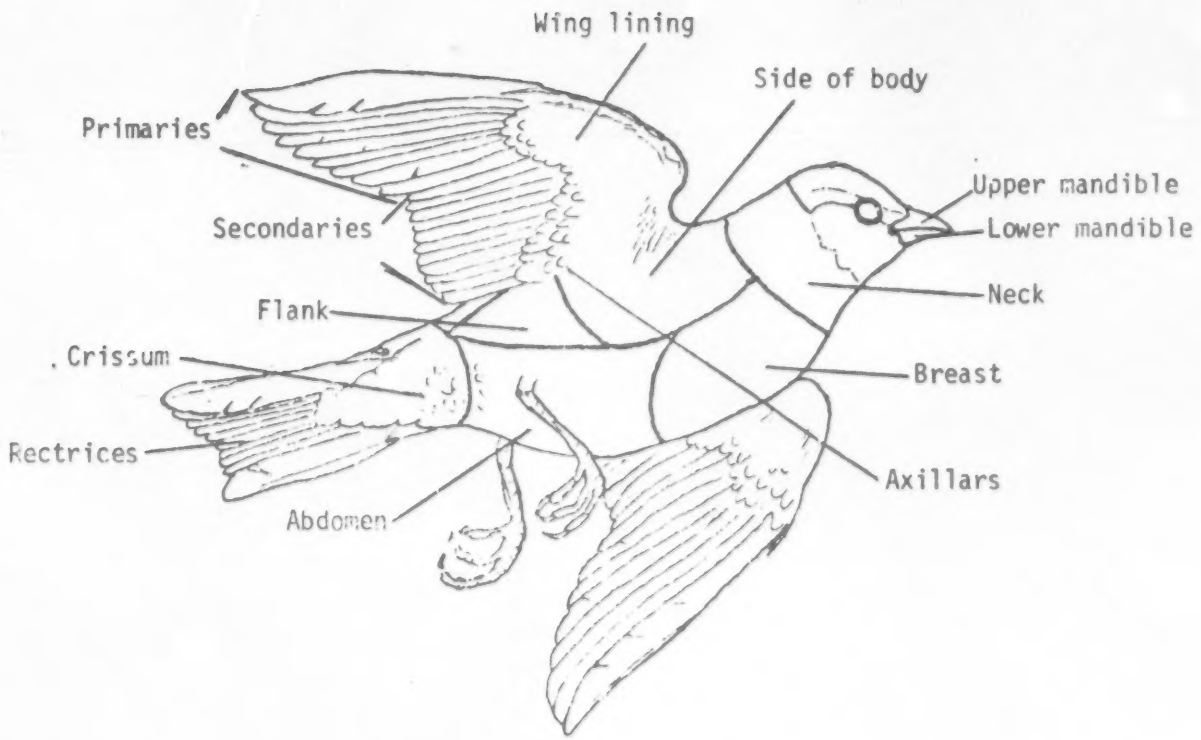
199. SKETCHING BIRDS

Hand out to the class mimeographed copies of a generalized drawing of a bird, such as the one shown at the bottom (trace if you wish). Approximately four bird outlines to a page work well. Instruct the class to visit the school grounds with paper and pencil, divide up and locate a bird. Students should take note of the coloration and markings of the bird they locate and make notes of such things with pencil on one of the bird outlines on their paper. Place as many details as they possibly can. Instruct them to take careful note as to the different colors of the bird they observe, and on what part of the bird the different colors end and begin. If possible, choose more than one variety of bird. Return to the classroom and allow students to color one of the outlines according to their notes and observations. When handing in their papers, one bird diagram should show evidence of their note-taking. A second diagram should show evidence of the accuracy of their color choice and placement. The diagram on the following page can be used by the teacher in conjunction with the exercise to demonstrate the different parts of a bird. Ask students to review the sheet on the topography of a bird and name the parts of a bird which coincide with distinctive patterns or markings on their drawings.



# Topography Of A Bird



200. PIGEONS AND SPARROWS

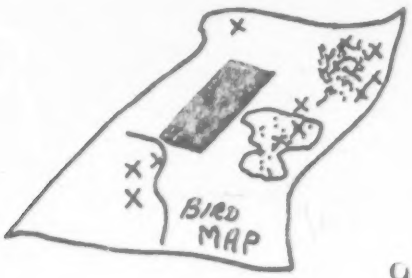
Go outside and watch house sparrows and pigeons as they travel over the ground. Let children pretend they are sparrows or pigeons. Devise games based on impersonation and identification. Observe both types of birds in flight. How do sparrows glide? Pigeons? Let the children use their arms to demonstrate flight patterns. Compare the behavior of other common birds.

201. MEASURING FRIGHT DISTANCE OF BIRDS

Certain bird species seem to be more timid than others. Various species will allow you to approach so close and then fly away. This distance is the fright distance. Needed is a white cloth with a stone for weight, a tape measure, pencil, and paper. Students walk until they sight a bird. Walk slowly toward the bird until it flies away. Drop the cloth when the bird flies and walk to the spot where the bird was. Measure the distance to the cloth. Repeat activity several times for best results. Using the same technique with different species, calculate the average fright distance. Which species of bird in your area allowed you to approach the closest? Which had greatest fright distance? Make a table listing most to least timid. Would shouting affect your fright distance?

202. BIRD MAPS

Make a map of the school ground and indicate, over several days of observation the places birds commonly congregate. Correlate this with the need for food, water and shelter.



OUR ENERGY-BASED ECONOMY
ACTIVITY SHEET 2

NAME_____

## THE DAY THE EARTH STOOD STILL

Some years ago, a movie was made entitled "The Day the Earth Stood Still." It was a science-fiction film about visitors from outer space who stopped all of our machines and energy supplies.

We are facing a dilemma today that could cause daily life as we know it to "stand still" in a different way. This is the energy dilemma. Energy resources – petroleum, natural gas, coal, water power, and nuclear energy, plus electricity which is made from these primary sources – are used to do work. Today, most of the economic, personal, and social activities carried out in the United States involve the use of energy resources. If we ran short of any substantial number of primary energy resources, we might find the world as we know it standing still.

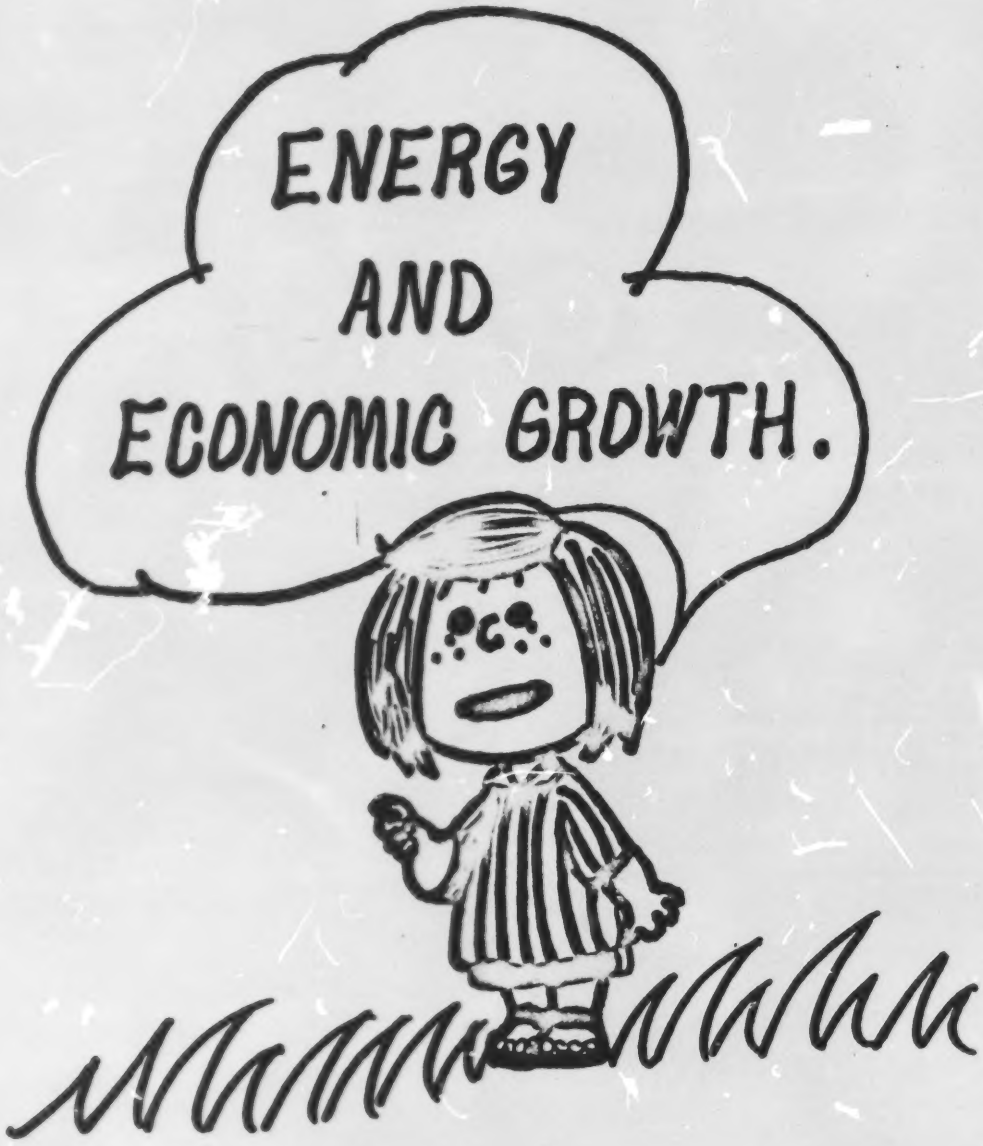
Take a moment and examine your own daily activities and you'll see what we mean. For example, turning on a light requires the use of electricity. Electricity is made through the conversion of a primary form of energy such as those listed above. Do you get a ride to school? Take a bus? Cars run on gasoline, made from petroleum. And buses run on gasoline or diesel fuel, made from petroleum.

Here is a checklist of some basic activities carried out every day. Put an X in the box next to those that in any way require the use of a primary energy resource or electricity.

| | | | | | |
|---|---|---|---|---|---|
| X | Using an automobile | X | Mining coal | | Painting a fence |
| X | Taking a train | X | Making steel | | Sewing on a button |
| | Jogging on the school track | X | Using water for a bath | X | Printing newspapers |
| X | Using the air-conditioner | | Shoveling snow off the driveway | X | Transporting mail |
| | Filling a glass with root beer | X | Making a telephone call | X | Cooking dinner |
| X | Watching television | X | Watering the lawn | X | Manufacturing clothing |

Between 1970 and 1985, the nation's population will increase by 37 million to a total of 241 million people. It is estimated that 19 million of the 37 million people will be between 20 and 35 years old – the ages when most people start families and buy and equip homes. You probably are part of this group. This means that you will be a major user of energy during the coming years. In the blank spaces below, list ten purchases or activities you want for the future – such as traveling, buying a boat, getting a new car. Then underline each item on your list if the use of energy is involved in making the item or carrying out the activity.

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____




# Mini Unit II

GRADE SEVEN

MINI UNIT II

SUBJECT: Social Studies, Math

OBJECTIVE: To help students learn more about the importance of natural resources, good transportation and a developed technology.

BACKGROUND: Information given in Mini Unit I.

MATERIALS: Film projector, record player

ACTIVITY:

1. Use filmstrip #2 of Our Energy Based Economy (available in county office.) Use parts of the BACKGROUND and Activity 2 to reinforce the filmstrip.

2. Use the worksheet, Economically Speaking, following RESOURCES. This activity presents a graphic overview of the business cycle, flow of labor, resources and money. A good culminating activity would be a class discussion of students' and their parents' employment as part of the economic cycle.

3. Use the worksheet, Getting Energy Supplies to Meet the Demands, following RESOURCES. This is a vocabulary exercise through which students can become familiar with the names of some energy resources.

ENRICHMENT ACTIVITIES:

1. List all the possible methods of transportation in your area. As a class, make a map of the area around your school (buses, trains), sidewalks and parking lots. List in order from largest to smallest which of the above takes up the most land. Mark the Transportation Chart following RESOURCES as to how each affects the environment. For example; does walking have any effect on air pollution? Water pollution? Does driving a car have any effect on air pollution?

2. Whenever a resource becomes more scarce, the law of supply and demand forces up the price. When it is too expensive for most users, there is a shift to a replacement resource. The shift from oil and gas to coal for the generation of electric power is an example. Have the class list ten of their favorite possessions that are made from oil or gas (synthetic fiber, plastic) and then discuss what might happen to the cost and availability of these items as oil and gas become less available.

EVALUATION: Students will evaluate their understanding of the importance of natural resources, good transportation and a developed technology by:

1. stating the major reasons for the growth and development of the American Economy.
2. defining energy and its major sources.
3. explaining important ways in which government affects the American Economy.

RESOURCES: Filmstrip with record:

Transportation: Where Do We Go From Here? from The Department of Education, Tallahassee, Florida

Outlook for Energy in the United States to 1985 available free from Chase Manahttan Bank, 1 Chase Manhattan Plaza, New York, New York 10015

Multimedia program:

Our Energy Based Economy, available from Jackson County Media Center.

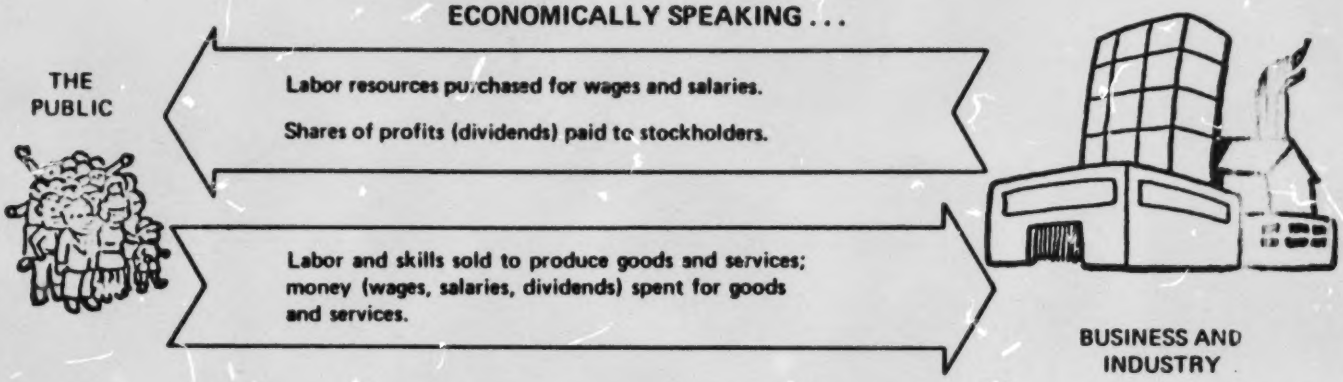
## Transportation

| Type of Transportation | Air | Water | Land | Noise | Litter | Is it available in your community? |
|---|---|---|---|---|---|---|
| Walking | | | | | | |
| Bicycle | | | | | | |
| Automobile | | | | | | |
| Bus | | | | | | |
| Plane | | | | | | |
| Train | | | | | | |
| Monorail | | | | | | |

OUR ENERGY-BASED ECONOMY
ACTIVITY SHEET 3

NAME _____

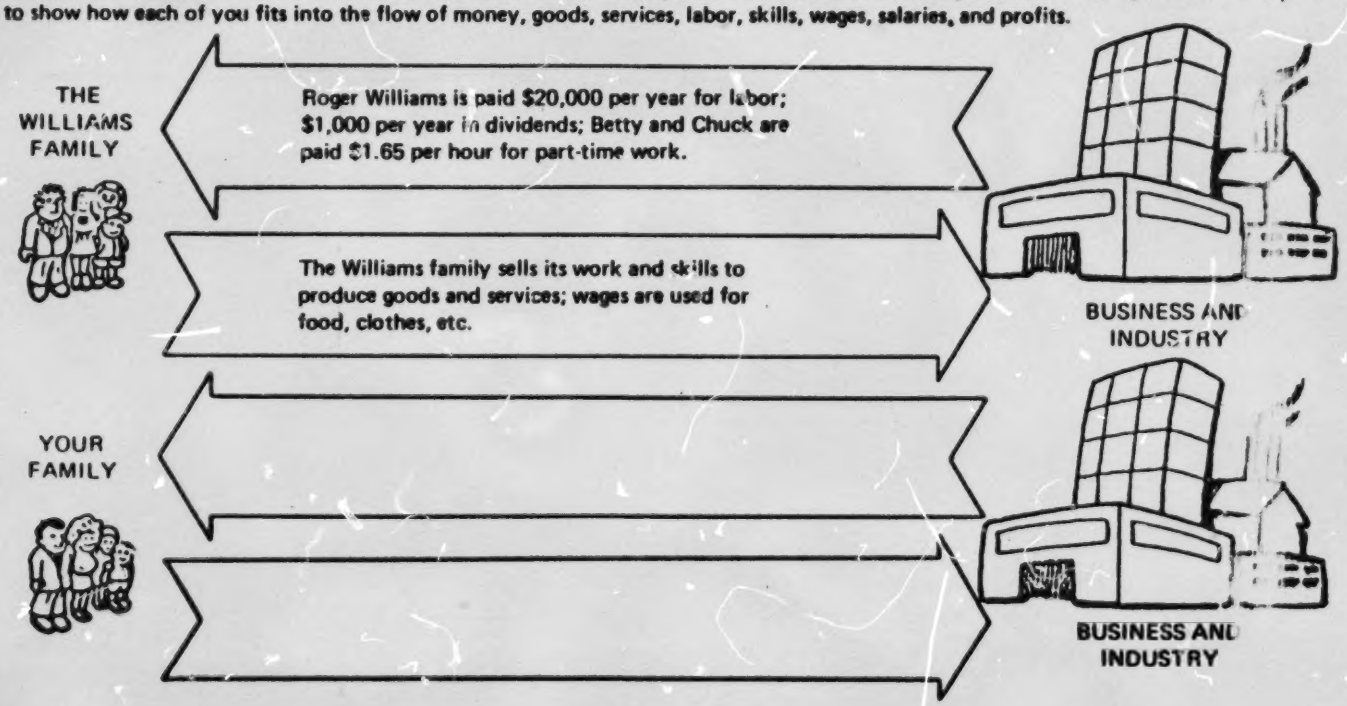
## ECONOMICALLY SPEAKING . . .


THE PUBLIC
Labor resources purchased for wages and salaries.
Shares of profits (dividends) paid to stockholders.
Labor and skills sold to produce goods and services; money (wages, salaries, dividends) spent for goods and services.
BUSINESS AND INDUSTRY

The Williams family lives and works within our economic system. Roger Williams sells his time, energy and skills to a glove factory, where he is the manager. The company pays Roger $20,000 a year. In addition, Roger owns stock in the glove company and in an electric utility. In this way, he owns a small part of the two companies and shares in their profits. His share is the dividend he receives during each year from both companies when earnings are high enough to pay dividends. Martha Williams uses some of the money Roger earns for food, clothes for the family, furniture, medicines, payments on the house, and so on. Betty Williams works part-time in the drug store. She earns $1.65 per hour and uses the money for books and magazines, guitar strings, and puts some away for a summer at a music camp. Chuck Williams works part-time in a music store. He earns $1.65 per hour and buys music for his trumpet, film for his camera, and puts some away for a new bicycle.

The Williams family buys goods, but they also buy services: they go to movies, use the public library, take trains and planes on trips and have their clothes dry cleaned. Money for goods and services goes to the businesses and industries which hire (buy) labor to provide more goods and services and keep the flow moving.

Below are two diagrams. The top one shows how the Williams family lives. The bottom one is for you to fill in. Use your own family to show how each of you fits into the flow of money, goods, services, labor, skills, wages, salaries, and profits.


THE WILLIAMS FAMILY
Roger Williams is paid $20,000 per year for labor; $1,000 per year in dividends; Betty and Chuck are paid $1.65 per hour for part-time work.
The Williams family sells its work and skills to produce goods and services; wages are used for food, clothes, etc.
BUSINESS AND INDUSTRY
YOUR FAMILY
BUSINESS AND INDUSTRY

OUR ENERGY-BASED ECONOMY
ACTIVITY SHEET 4

NAME_____

## GETTING ENERGY SUPPLIES TO MEET THE DEMANDS

An important economic concept is that of "supply and demand." This can be explained by saying that *what is produced is determined by what people are willing to buy.* Factors such as supply, available money, and government regulation affect th demand.

From this, you might think the amount of energy available would depend on whether people wanted to use energy resourc Unfortunately, this isn't quite true. Many experts believe that our great dependence on energy combined with population g is causing the days of cheep energy to end.

In List A below are some words or terms related to current energy problems. In List B are descriptive facts abou the words terms. After you read both lists, match them by writing the correct letter from List B in the space provided in front of the t in List A.

| | LIST A | LIST B |
|---|---|---|
| g | 1. Energy | a. An increase in the number of people living in a given country or |
| j | 2. Investment | b. Crude oil, a fossil fuel tha supplies the chemical base used in the manufacture of thousands of prod cts. |
| a | 3. Population growth | c. The ways man uses his inventions and discoveries to satisfy his nee and desires. |
| c | 4. Technology | d. Radiant energy obtained from the sun. |
| b | 5. Petroleum | e. A secondary form of energy, usually produced by burning coal or fuel to make steam which runs generators. |
| f | 6. Natural gas | f. A fuel, probably formed beneath the earth's surface millions of ye ago by the same forces that created petroleum; often carried throu pipelines and used for home heating and industrial purposes. |
| e | 7. Electric power | g. The ability to do work. |
| i | 8. Coal | h. Heated water (steam) obtained from heat within the earth, a relativ undeveloped source of energy. |
| h | 9. Geothermal energy | i. A fossil fuel found in nature as a soft black or brown rock which supplies more than 1/5 of the power and heat used in the U.S. |
| d | 10. Solar energy | j. The use of funds to provide income or profit. |

In your opinion, which sources of energy will we depend on most in the next twenty years? Why? Answer this question in a cla discussion or in the space below.

# Mini Unit III

GRADE SEVEN

MINI UNIT III

SUBJECT: Social Studies, Math

OBJECTIVE: To realize that no modern country has the resources to produce everything its citizens want or need, it must choose what to do with the limited resources it does possess and determine how to obtain materials it does not possess.

BACKGROUND: Information given in Mini Unit I.

MATERIALS: Filmstrip machine, record player

ACTIVITY:

1. Use filmstrip #3 of Our Energy Based Economy (available in county office.) Use part of the BACKGROUND and Activity 2 to reinforce the filmstrip.
2. Use the worksheet, An Energy/Economics Inventory: How Does Energy Fit Into Your Future? located after RESOURCES. This activity can be the basis for a discussion of lifestyle and its relationship to energy uses and economic growth.

ENRICHMENT ACTIVITIES:

1. Arrange to interview the city manager or a person recommended by him concerning the energy outlook in Florida. The questions that follow can form the basis for your interview.
   a. What energy resources do we supply the most of?
   b. How does this resource reach the consumer?
   c. Why was this resource first utilized?

d. What types of employees are used to produce this resource? (clerical, packaging, shipping, sales, etc.)

e. What type of ownership does this resource have?

f. Who decides how profits are distributed?

2. Make a bulletin board illustrating our use of resources and alternate ways of obtaining resources not already available.

3. Many other nations are envious of America's availability of natural resources. Some of the countries are angered by the fact that the U.S., with only six percent of the global population, consumes approximately 35 percent of the world resources. Discuss the implications of a social group using 25 times as much of an unrenewable resource as another social group.

EVALUATION: Students will illustrate their knowledge that no modern country has the resources to produce everything its citizens wants and needs. It must choose what to do with the limited resources it does possess and determine how to obtain materials it does not possess by:

1. defining economic growth and explaining why it is desirable.

2. suggesting two ways by which we can increase energy supplies.

3. explaining the necessity for economic planning.

RESOURCES: Phamplet from:

Petroleum Today
1901 K Street, N.W.
Washington, D.C. 20006

Fuel for the Future: The Economics of Energy Supply, by Edwin L. Kennedy 1972.

Multimedia Program from:

Jackson County Media Center
Marianna, Florida

Our Energy Based Economy

OUR ENERGY-BASED ECONOMY
ACTIVITY SHEET 11

NAME_____

## AN ENERGY/ECONOMICS INVENTORY: HOW DOES ENERGY FIT INTO YOUR FUTURE?

Everyone has some daydreams about how they will live when they are older. Some people imagine financial success or fame or fun as what they would like from life.

Many of the objects or activities we want require the use of energy. Experts say that we may have to start allocating (distributing) energy for specific purposes in the future. It may be necessary for us to choose one item over another one because they both use energy and we have only enough energy for some activities – not all. For example, we might want to buy a car and a boat. But there is only enough energy available for each family to power *either* a car *or* a boat, we would have to choose which item we wanted or needed more.

Using the chart below decide what objects or activities mean most to *you*. Pretend that you have 150 energy points to use each year. Then put a check mark (✓) next to each item or activity you select from the list and add up the total number of energy points these will require.

| Item or Activity | Points Required | Points Used |
|---|---|---|
| 1. Automobile | 40 | |
| 2. Sailboat | 5 | |
| 3. Power boat | 20 | |
| 4. Bicycle | 2 | |
| 5. Airplane Flight (round trip) to Europe | 25 | |
| 6. Caribbean Cruise | 20 | |
| 7. 1,000 Mile Auto/Camping Trip | 40 | |
| 8. Electric Refrigerator | 30 | |
| 9. Electric Washer/Dryer Combination | 20 | |
| 10. Heating, Air Conditioning Facilities for Your Home | 40 | |
| 11. Color Television | 10 | |
| 12. 4-Channel Stereo Set | 8 | |
| 13. Electric Lights in Your Home | 10 | |
| 14. Motorcycle | 8 | |
| 15. Motion Picture Camera and Projector | 5 | |
| 16. Electric Dishwasher | 20 | |
| TOTAL | 303 | |

Did your total go over 150? If it did, draw a line through those items you could certainly do without. Then circle the items you might be able to use only occasionally instead of all the time. Would you have to change your life style if energy had to be allocated as in this activity sheet? Explain on the reverse of this sheet how you feel your plans would be affected.

# Mini Unit Ⅳ

GRADE SEVEN

MINI UNIT IV

SUBJECT: Social Studies, Math

OBJECTIVE: To realize that the chief difference between the way it used to be and the way it is now is energy--how much, what kind, and how it is used.

BACKGROUND: Information given in Mini Unit I.

MATERIALS: Encyclopedia, poster paper, magazines, styrofoam or other scrap materials

ACTIVITIY: Use the worksheet, The Way It Used To Be, following RESOURCES.

ENRICHMENT ACTIVITIES:

1. Locate some of the older houses in your area. Contrast the style, size and building materials in these houses with those of present-day houses. Has the environment changed in your area since these houses were built? What has caused the design of houses to change in your area?

   Talk to a local builder. Ask him how the construction of houses and apartments has changed in the last twenty years. Ask him what changes he predicts for the future. After you have completed your research, make a display to show how the design and construction of houses in your area has changed.

   Not all homes today are built at the homesite. Find out about the construction of mobile homes, modular houses and prefabricated houses. What discoveries have made the construction of these houses possible? List some advantages of each type of house.

What is a condominium? Were they around fifty years ago? How are they constructed? Compare the homes of people in different periods of history. Find out what the environment was like; how the houses were built; what materials were used and why. Present your findings to the class.

2. Careers are constantly changing. Make a list of jobs the male and female members of your immediate family have had for several generations. Add to this list what you would like to do. Study your list. Do all of the jobs still exist? Did some of the more recent jobs exist twenty-five years ago? How has the role of the female member of the family changed? How have these changes in jobs affected the environment? How have changes in the environment produced or eliminated jobs? What are some of the other factors responsible for changes in the job picture?

   Make a "Careers Notebook". Keep a list of the careers you read about in your studies. List also the training needed for each, the income expected and how the job affects the environment.

   Keep a scrapbook of environmentally related careers in this area. Gather the same information as above. You can start with a fisherman, mechanic, newspaper woman and a fish and game officer. Keep going from there.

   Keep a list of new jobs that have been created in your area in the last five years. Find stories about jobs that no longer exist.

3. An ecosystem is a community that includes both living and non-living things. Are your local ecosystems endangered? Keep a newspaper file of articles about the activities of man that may be endangering local ecosystems. Discuss them in class.

EVALUATION: Students will demonstrate their understanding that the chief difference between the way it used to be and the way it is now is energy by:

1. making a chart or display to contrast jobs that no longer exist and show new jobs.

2. making a list of the reasons homes have changed and finding some way to show the ways homes have changed.

3. making a display to show the ways the activities of man are affecting the ecosystems studied.

RESOURCES:

Slides with Tapes:

Career Implications of Solutions to Environmental Problems

Department of Education
Tallahassee, Florida

Citizen Action Guide to Energy Conservation

Citizens' Advisory Committee on Environmental Quality
1700 Pennsylvania Avenue, N.W.
Washington, D.C. 20006

Our Energy Based Economy

Available from Jackson County Media Center

OUR ENERGY-BASED ECONOMY
ACTIVITY SHEET 1

NAME _____

## THE WAY IT USED TO BE

We hear often about how fast things are changing – life styles, clothes, cars, prices, behavior. Books, magazines, television pro[illegible] even people we know – compare the present with "the way it used to be."

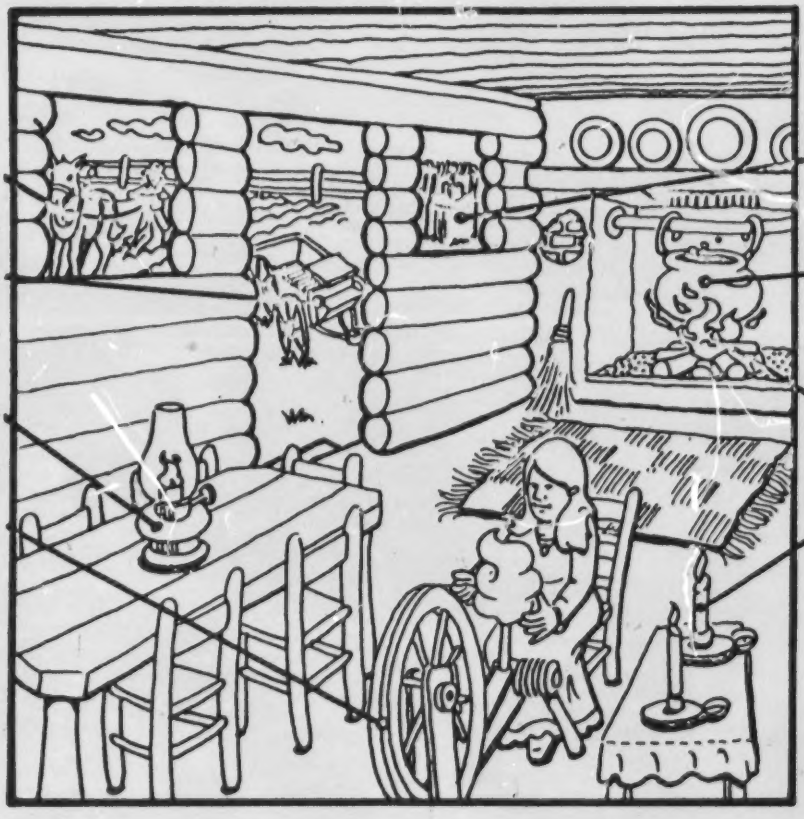
How *did* it used to be? Take life in Colonial America, for example. Did people really live very differently, and if so, in w[illegible] ways? And why?

Below is a drawing showing part of a Colonial American home. The scene shows the way it used to be. On the right and l[illegible] sides of the picture, on the lines provided, write the way it is now. List what has been substituted in place of the earlier ways of doing the things illustrated.

### THE WAY IT USED TO BE

**THE WAY IT IS**

1. Tractor _____
2. Automobile _____
3. Electric light _____
4. Manufactured clothing _____



**THE WAY IT IS**

5. Piped water _____
6. Stove (gas, electric) _____
7. Furnace _____
8. Electric lights _____

The chief difference between the way it used to be and the way it is now is *energy* – how much, what kind, and how it [illegible] On the back of this sheet, make a list of the items in the drawing. Next to each one, write the modern invention that [illegible] replaced each one and write down the difference in the energy used. For example, Number 1 would read something like: [illegible] drawn plow – Tractor – Diesel powered engine has replaced muscle energy of horse and man.

# Mini Unit V

GRADE SEVEN

MINI UNIT V

SUBJECT: Social Studies, Math

OBJECTIVE: To recognize that although our present supply of energy is being consumed there are many new sources that have not been developed.

BACKGROUND: Information given in Mini Unit I.

MATERIALS: None

ACTIVITY:

1. Use the worksheet, Getting The Facts: Energy Outlooks, found after RESOURCES. This fact sheet gives information about our basic sources of energy (oil and natural gas, coal, nuclear power, hydroelectric power).

2. Read the article entitled "New Ways to More Power with Less Pollution" by Lawrence Lessing in the November, 1970, Fortune magazine and make a report to the class. This article deals with the ways and means of providing solar energy.

3. Organize a field trip to the Farley Nuclear Power Plant at Gordon, Alabama.

ENRICHMENT ACTIVITIES:

1. Choose a chapter from How Will We Meet The Energy Crisis: Power For Tomorrow's World and give oral reports as interest areas develop.

2. Make a bulletin board showing these new sources of energy: nuclear, solar, geothermal, superconductivity, magnetho-hydrodynamics, waste recycling.

EVALUATION: Students will demonstrate their knowledge of future sources of energy by listing three new sources and a short explanation of cost and accessibility.

RESOURCES:

Book:

How Will We Meet The Energy Crisis: Power For Tomorrow's World. By Reed Millard and the editors of Science Book Associates. New York: Julian Messner, 1971.

Filmstrip with record:

Environment: Changing Man's Value, Part II from the Department of Education, Tallahassee, Florida.

Booklet:

Environment for Man: The Next Fifty Years. By William R. Ewald, Jr., Indiana University.

Multimedia program:

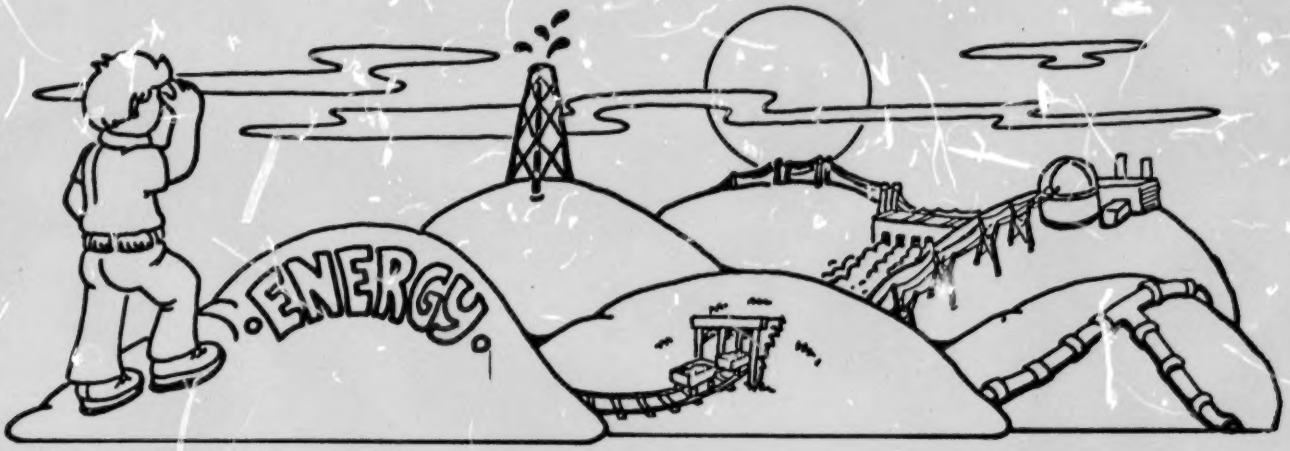
Our Energy Based Economy, available from Jackson County Media Center.

To the teacher: This is a fact-gathering library activity.

OUR ENERGY-BASED ECONOMY
ACTIVITY SHEET 5

NAME_____

## GETTING THE FACTS: ENERGY OUTLOOKS




### OIL AND NATURAL GAS

During 1973, we used over 8,400 gallons of oil every second, almost three and one-half gallons a day for every man, woman, and child in the country. Oil and natural gas provide about 77 percent of the energy we use.

In the first half of 1974, one-third of the nation's oil supply came from foreign sources.

The cost of drilling one exploratory oil well is from $100,000 to $5 million.

### COAL

Coal provides nearly 18 percent of the energy we use. The U.S. has enough coal reserves to last us for over 600 years at current rates of use.

But government regulations to control air pollution and land damage from mining operations make some coal unusable and other coal very expensive.

### NUCLEAR POWER

At present, nuclear power supplies less than 2 percent of the nation's total energy requirements.

The electric utility industry has invested about $7 billion in nuclear power development and has pledged another $250 million in research and development.

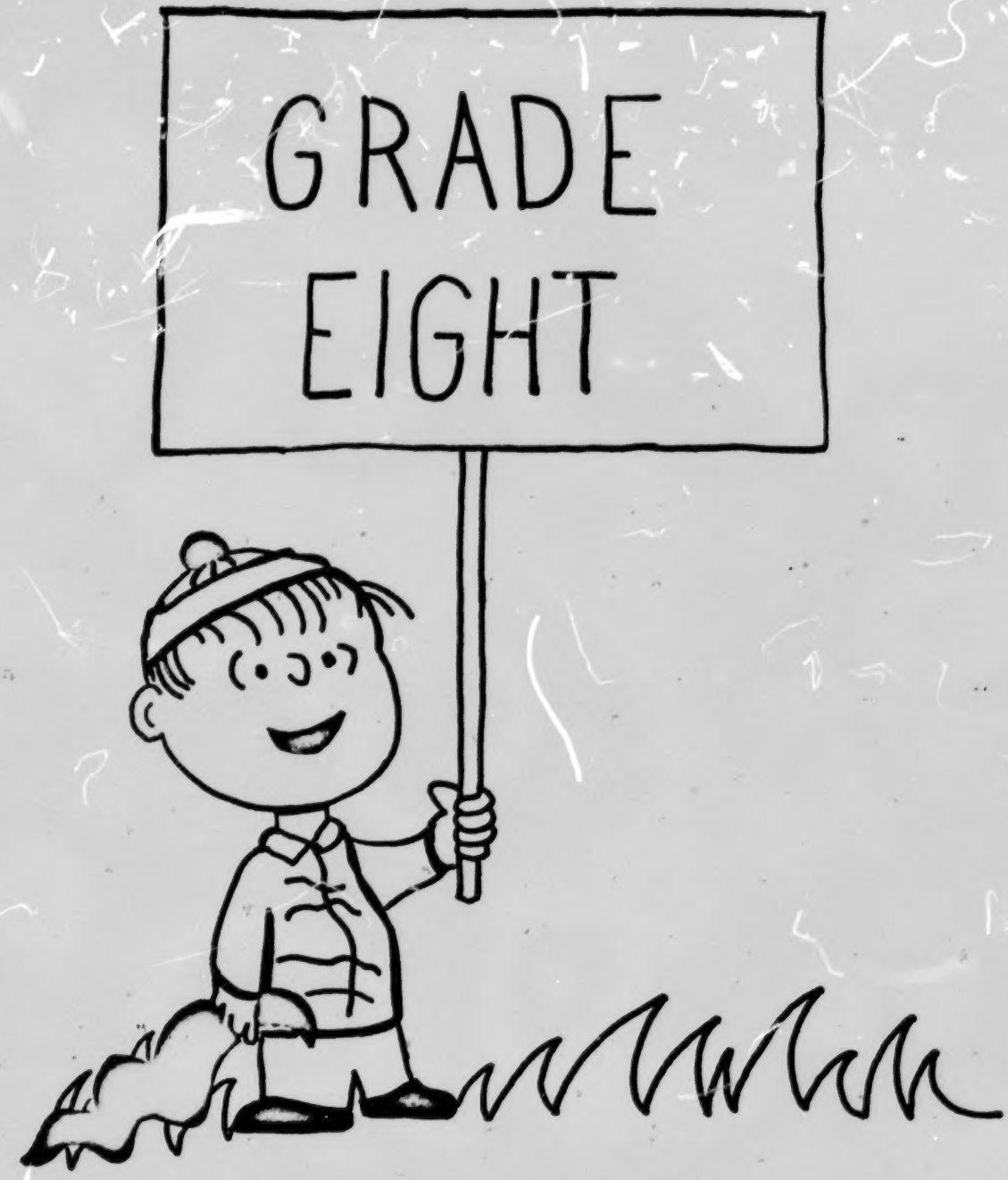
### HYDROELECTRIC POWER

In 1973, hydroelectric plants accounted for about 4 percent of all U.S. energy supplies. By 1985, they will provide only 3 percent.

### IT'S YOUR TURN . . .

Using reference books in a library, plus newspapers and magazines, determine what other energy sources might be important to us in the future. Review the following and then write on the back of this sheet the important facts about each of these future energy sources and what must be done to benefit from them:

- Fusion
- Garbage and animal waste
- Geothermal energy
- Oil shale
- Solar energy
- Tar sands


GRADE
EIGHT

# Mini Unit I

GRADE EIGHT

MINI UNIT I

SUBJECT: Math, Science

OBJECTIVE: The student will understand the necessity for man's need for a close contact with nature and an aesthetic environment if he is to grow as a balanced and creative individual.

BACKGROUND: Information found in Our Environment 3, Aesthetics, Filmstrip 2, "It's Really Up To Us!", EMC Educational Program available at the County Office.

MATERIALS: Filmstrip projector, cassette player

ACTIVITY:

1. Filmstrip "It's Really Up To Us!" listed in BACKGROUND.

2. Involve students in role playing activity. Set the stage for the following situation:

   The family is together over dinner, discussing the fact that the steel mill where the father works may close down. The factory's smoke stacks are polluting the air. The state pollution agency has ruled that anti-pollution equipment must be installed within one year or the factory must close.

   The company has pointed out, rather convincingly, that a competing company in a neighboring state is not required to install this equipment. Because of the cost of the anti-pollution equipment, the father's company will have to charge more for its steel, and won't be able to sell as much as the mill in the neighboring state. The company has decided that, if it has to install the anti-pollution equipment, it will close down.

   Roles:

   Father-- against pollution but doesn't know where else he can work. He has been with the steel mill since he left school.

Mother-- very angry; doesn't care about the pollution problem; too concerned with the problem of providing food and shelter for the family.

Son-- age 10. Thinks the idea of possibly moving to another city is exciting. Talks about different cities and different jobs his father might get.

Daughter-- age 19. Empathizes with her father, but is very concerned about pollution and feels that, in the long run, more people will benefit from clean air. She believes that some people and jobs will have to be displaced in order to solve the pollution problems.

3. After role playing activity, visit the Gulf Power Plant, Sneads, Florida, and view the anti-pollution equipment.

4. Nonreturnable bottles and cans are destroying the aesthetic environment faster than they can be picked up. In addition, great expense to the public is incurred by highway crews, etc., in picking them up along roads and highways. Have students write state legislators and city officials asking for legislation to ban the sale of non-returnable bottles and cans. Some communities have already passed such laws.

5. Aluminum cans are far worse than tin because they do not disintegrate. An aluminum can discarded along a stream will still be there, intact, one hundred years later. Have your class write six state legislators requesting a ban on the sale of aluminum cans in your state. Some states are already moving in that direction.

6. Studies on maintenance costs along roadside and parks have shown that it cost $.35 to pick up every bottle, can or piece of paper. Send your class around the school grounds collecting litter. Return and compute how much money your class saved taxpayers.

ENRICHMENT ACTIVITIES:

1. Appoint a committee to investigate how your community disposes of its trash, and give a formal report to the class. Is it an effective program? What other disposal methods are being considered? Have the class make a list of innovative ways to dispose of or recycle trash.

2. Scattered litter is ugly to view. Also, its injurious to both man and machine. In one state alone, 621 accidents were reported during the past three years as caused by vehicles striking or swerving to avoid litter on the road. The United States Coast Guard has reported during one year, 200 vessels were involved in accidents caused by striking floating debris. An estimated 130 persons annually lost their lives in litter-fed fires; every 12 minutes a home is destroyed or damaged by fires started in trash.

   A. If the average cost for repair of an automobile involved in a accident is $200.00, compute the amount of money spent repairing the ones damaged due to accidents caused by litter during the past three years.

   B. If the average boat repair cost is $500.00, how much money is spent repairing those damaged due to striking floating debris?

   C. Calculate the number of homes that are destroyed or damaged due to fires starting in trash:

      (1) in a day.

      (2) in a week.

      (3) in a year.

3. Why do people litter? Some of the reasons are as follows: carelessness, laziness, indifference and insufficient litter receptacles. Only 21% of the people in the United States live in communities where there are enough litter containers. About half of the nation's cars and only 6% of the boats have litter bags.

A. Determine the number of people in the United States who do not live in communities where there are enough litter containers (assume the population of the United States is 200 million).

B. If there are 90,000,000 cars in the United States, how many cars do not have litter bags?

C. In Jackson County, the population is about 37,800 and there is about one boat for every 19 residents. Determine:

(1) the number of boats in Jackson County.

(2) the number of Jackson County boats that do not have litter bags.

4. Everyone and every classroom can create a thing of beauty. Plan a number of individual and group projects that will enhance the school area and each child's neighborhood. Some suggested projects:

A. Let students obtain trees free from the state conservation department. Have an official tree planting ceremony on a designated school area. Invite speakers. Involve the community (Arbor Day).

B. Business and industry are very sensitive to public criticism. Select local companies which are not making an attempt to keep plant areas neat and landscaped. Have children write to the president of the company. (You may see some positive results! It has happened.)

EVALUATION: Students have shown an understanding of the necessity for mans need for a close contact with nature and the aesthetic environment.

RESOURCES:

Records:

"Whose Garden Was This", John Denver

Filmstrip from: (Free)

American Institute of Architects
1785 Massachusetts Avenue
Washington, D.C. 20036

No Time for Ugliness

Media Services
Florida State University
Tallahassee, Florida 32306

The Gifts

# Mini Unit II

GRADE EIGHT

MINI UNIT II

SUBJECT: Math, Science

OBJECTIVE: The student will recognize both natural and man-made air pollution factors and will investigate ways of controlling them.

BACKGROUND: Information found in Our Environment 4, Atmosphere, Filmstrip 4, "Our Spaceship Earth...Can It Survive", EMC Educational Program available at the County Office.

MATERIALS: Filmstrip projector, cassette player

ACTIVITY:

1. Filmstrip "Our Spaceship Earth...Can It Survive" as listed in BACKGROUND.

2. Pollutants are injurious to the health of all animals and plants and are destructive to cloth, painted surfaces, rubber, metals, leather, nylon, paper and other substances.

   In Polk County, Florida, a dozen phosphate plants produce 31% of the world's output of phosphates.

   Although the industry is working to reduce them, certain pollutants are emitted during the production of phosphate fertilizers.

   It is estimated that the added cost of living per person in Florida due to air pollution is about $150 per year.

   A. As of the 1970 census, there were 6,789,443 people living in the state of Florida. Compute the total increase in their cost of living for one year due to air pollution.

   B. The total production of phosphates was about 21 billion pounds in 1971. About how many tons of phosphate did Polk County produce in 1971?

3. Aggravated by air pollutants, emphysema is the fastest growing cause of death in our country today. In the ten-year period from 1950 through 1959, death caused by emphysema rose from 1.5 per 100,000 to 8 per 100,000 among the male population. In 1970 the population of the United States was about 200 million, and 50,000 persons died from emphysema.

   A. Determine the death rate per 100,000 from emphysema in 1970.

   B. Determine the percent increase from 1950 to 1959 in the death rate, due to emphysema, for the male population.

4. Complete worksheets following RESOURCES.

ENRICHMENT ACTIVITIES:

1. Approximately 1/5 pound of hydrocarbons is given of by a car burning one gallon of gas. Have the class make a chart like the one following RESOURCES.

   A similiar chart may be made for carbon monoxide. Approximately one pound of carbon monoxide is given off by one gallon of gas. Substitute in chart following RESOURCES, Dx1 = E.

   The amount of hydrocarbons and carbon monoxide given off by all the cars of the parents can be determined by adding the figures in Column E on the chart. Ask the class to make a projection of the hydrocarbons and carbon monoxide given off by the number of cars of all the families in the school, and in your city and state. Using the information given on the chart, have the students determine which make of car produces the least amount of hydrocarbons and carbon monoxide per 1,000 miles traveled.

2. To demonstrate the effect of carbon monoxide on a member of the animal kingdom, do the following:

   Place about two inches of aquarium water in each of three pint jars. Place two guppies in each jar. Use a large plastic bag to collect carbon monoxide from an auto exhaust.

Release this gas slowly into the water of jar marked A. Cover this jar. Collect fresh air in a second plastic bag and release the air slowly into the water of the second jar marked B. Cover jar B. Cover the third jar without adding anything. Have the students observe the guppies in each jar.

RESOURCES: Film from:

Astrafilms, Inc.
National Medical Audio-Visual Center

Pollution

Record from:

Grace N. Lacy, Director of CUE
University of the State of New York
State Department of Education
Albany, New York

Pollution

Game from:

Curriculum Development Center
Wellesley School System
Seawood Raod
Wellesley Hills, Mass. 02181

## Auto Pollution Chart

| A<br>Make Of Car | B<br>Miles Per Gallon | C<br>Mileage On Car | D<br>Number of Gallons Burned (C÷B=D) | E<br>Pounds of Hydrocarbons Given Off To The Air By Family Car (Dx1/5=E) |
|---|---|---|---|---|
| | | | | |

(1,000 ÷ B) x .2 = pounds of hydrocarbons per 1,000 miles

(1,000 ÷ B) x 1 = pounds of carbon monoxide per 1,000 miles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# *STUDENT ACTIVITIES FOR FILMSTRIP IV*

Investigate ways in which you and your family add to air pollution. Discuss with your family ways in which this can be cut down. (For instance, you can make a compost heap instead of burning leaves.) Remember, excessive use of electricity causes the local power plant to add to air pollution. What ways can you and your family cut down on this? Especially when you understand how much use of your car adds to pollution, make plans to cut down on this (by riding your bike, or walking when possible, taking the bus or other mass transit, joining a car pool, etc.)

**WAYS MY FAMILY CAN REDUCE POLLUTION** **LIST DISADVANTAGES**

1.

2.

3.

4.

5.

6.

**CONCLUSIONS**

Before your parents st[illegible] the car in the morning, fix a piece of Kleenex or white cloth around the aust pipe with a rubber band. Bring this to school to analyze. (Better be careful with this experiment get your parents' help. Researc[illegible]arbon monoxide – what it is and why it happens, and the effect it on human beings.)

MOUNT PIECE OF KLEENEX ON X
(After car has run for five minutes)

NCLUSIONS

## *STUDENT ACTIVITIES FOR FILMSTRIP IV*

Check the pollution from local factories and burning leaves, garbage, etc. If possible, take photographs. (Are there ways in which you or your family, or your school, add to air pollution? Can anything be done to cut down on this?)

| KIND OF POLLUTION NOTED | IN YOUR COMMUNITY, WHERE | TYPE |
|---|---|---|
| (Example) Pickle factory | Corner of Fifth & Broadway | Black, smelly smoke |

| KIND OF POLLUTION NOTED | IN YOUR OWN HOME, OR SCHOOL | TYPE |
|---|---|---|
| (Example) Burning leaves | Back yard | Black, smelly smoke |

**IDEAS FOR CUTTING DOWN ON THESE TYPES OF POLLUTION**

(Example) Instead of burning leaves make a compost heap of them to fertilize garden.

# Mini Unit III

GRADE EIGHT

MINI UNIT III

SUBJECT: Math, Science

OBJECTIVE: Student will recognize the major sources and effects of fresh water pollution and the delicate balance between ecosystems.

BACKGROUND: Information found in Our Environment 1, Fresh Water Communities, Filmstrip 2, "Rivers", EMC Educational Program available at the County Office.

MATERIALS: Filmstrip projector, cassette player

ACTIVITY:

1. Filmstrip "Rivers" as listed in BACKGROUND.
2. Get statistics on pollution from local Conservation Department, Fresh Water Game and Fish Commission, etc., through an interview of the director or have a member of the commission visit the classroom to give statistics and answer questions.
3. Since 1970, 250 violators of pollution laws have been cited by the Florida Department of Water and Air Pollution Control. Of these, 100 have corrected the condition and their cases were dismissed. Of the cases which remain, 51 involve liquid industrial waste and 63 involve violations by sewage treatment plants operated by local governments or subdivisions.

   A. What percent of the violators mentioned have corrected the conditions for which they were cited?

   B. What percent of the remaining violators were cited for reasons other than liquid industrial waste or sewage treatment violations?

ENRICHMENT ACTIVITIES:

1. Make a poster or collage from magazines illustrating how rivers start from springs and are joined by

other streams to form rivers; how they wear channels; how falls and rapids are formed.

2. Divide class into four teams. Each team will need 2 quart jars filled with hot water and a 14"x4" square of soiled fabric. Ask each team to do the following:

   Team #1 adds 1 tablespoon phosphate detergent to 1 quart water.

   Team #2 adds 1 tablespoon soap to 1 quart water.

   Team #3 adds 1 tablespoon soap and 1 tablespoon washing soda to 1 quart water.

   Team #4 adds 1 tablespoon "no phosphate" detergent to 1 quart water.

   After each team adds its particular soap or detergent to water, agitate the jar. Add the square of fabric. Cap the jar and shake until fabric is clean. Rinse fabric in the jar of clear water by putting fabric in the jar, capping the jar and agitating.

   Test pH level of wash water using pH paper, Hach Kit, or other means. Compare the cleanliness of fabric swatches and their respective pH levels of the washing water.

3. Obtain a plastic bucket and dig a hole large enough for the bucket to fit into. Fill the bucket with water and you have an instant mini-pond. Have your students observe their pond every few days. In the mornings before school the teacher should drop waste paper, gum, candy wrappers, apple cores, and other assorted bits of trash into the mini-pond. Let your class "discover" their polluted pond. Ask the class to consider how many times they have contributed to this kind of pollution. What can be done to stop this? How do they feel about their pond being destroyed by people?

4. Computing the amount of water, if any, your home is wasting due to leaks in the plumbing or fixtures.

Wait for a half day or full day that you know no one will be home using water. Before you leave, make sure all the water faucets are turned off and read the water meter. Record the time that you read the meter. When you return, read the meter and record the time again. Determine how many gallons of water have passed the meter while you were gone and the total number of hours that you were gone. If you divide the number of gallons of water passing the meter by the number of hours between readings, you will get the number of gallons per hour that is being wasted through leaks.

EVALUATION: Students will demonstrate their knowledge of major sources and effects of fresh water pollution and the delicate balance between ecosystems by completing the activities.

RESOURCES: Film from:

Shell Oil Company

River Must Live

# Mini Unit IV

GRADE EIGHT

MINI UNIT IV

SUBJECT: Math, Science

OBJECTIVE: Students will recognize the major sources and effects of salt water pollution.

BACKGROUND: Information found in Our Environment 5, Salt Water Communities, Filmstrip 3, "Oceans Alive?", EMC Educational Program available at the County Office.

MATERIALS: Filmstrip projector, cassette player

ACTIVITY:

1. Filmstrip "Oceans Alive?" as listed in BACKGROUND.
2. Use the Pollution Chart in the materials for Our Environment 5. Have students research how the categories affect their own animals and eventually themselves. Make a list of some of the country's major polluters in each category; collect some of their ads, analyzing them for smoke-screen and aesthetic pollution, evasion, loaded statistics and other tricks.
3. Have an Ocean Day. Make murals, exhibits, scrapbooks to display. Make up anti-pollution skits and songs. Make a class newspaper to be printed and handed out. Make "S.O.S.--Save Our Seas" pins (out of bio-degradable materials).

ENRICHMENT ACTIVITIES:

1. Research the laws, national and local, already on the books which provide a certain promise of safeguard.
2. Find out about the "Red Tide" in the Florida Gulf, the shrimp and oyster industries in the Gulf of Mexico.

3. Role play the following:

   Children will be familiar through TV, etc., with some of the recent oil spills from offshore wells or cargo tankers rupturing at sea. The oil-coated bays and beaches take years to recover their former balance. Some areas will never recover.

   Divide your class for a "Federal Committee Hearing".

   Five representatives of an oil company seeking off-shore drilling rights off the coast of Texas. (They would push the economic gains to the federal government through taxes. Off-shore oil rights are under the jurisdiction of the federal government and oil companies pay millions of dollars annually in taxes for off-shore oil. They would also present the federal committee members with their safe-guard equipment they plan to install.)

   Five members of the Texas State Quality Environment Commission. They would argue against granting the off-shore drilling rights by pointing out the danger of accidental oil leaks to all marine life in the area, beaches, shore birds, etc.

   Five members of the federal committee who will decide, after hearing presentations from both lobbying groups, whether to grant the oil rights to the company or not. These members should be prepared to ask appropriate questions to each group.

   Other members of the class would be observers and would be free to ask questions of any of the three groups. The teacher acts as a guide but should not attempt to influence the decision of the federal committee.

5. Field trip to Marifarms (shrimp hatchery in Panama City, Florida).

EVALUATION: Students will be able to list sources and effects of salt water pollution upon completion of the activities.

RESOURCES: Film from:

King Screen Productions
320 Aurora Avenue N.
Seattle, Washington 98109

Men at Bay

# Mini Unit V

GRADE EIGHT

MINI UNIT V

SUBJECT: Math, Science

OBJECTIVE: The student will recognize the increasing problem of noise in our everyday environment and ways in which noise can be reduced.

BACKGROUND: Information found in Our Environment 2, Sound and Noise, Filmstrip 2, "Sound and Noise", EMC Educational Program available at the County Office.

MATERIALS: Filmstrip projector, cassette player, tape recorder

ACTIVITY:

1. Filmstrip "Sound and Noise" as listed in BACKGROUND.

2. Excessive noise is a leading cause of hearing loss and certainly may be classified as a kind of pollution. It is estimated that the approximately 200 million living citizens of the United States, 20 million have measurable hearing loss Ten million of these people are considered to have suffered severe hearing handicaps.

   A. Compute the percent of U.S. citizens having measurable hearing losses.

   B. Compute the percent of U.S. citizens having severe hearing handicaps.

3. No one is immune to the long-range effects of noise. There are 16 million people exposed to "on-the-job" noise levels which may permanently damage their hearing. As a result, industry pays approximately $2 million per day in compensation claims, loss in working efficiency and reduced property values due to excessive noise.

   A. Calculate the cost that excessive noise causes industry during the period of one year.

B. Determine the percent of U.S. citizens who are exposed to dangeroud "on-the-job" noise levels.

ENRICHMENT ACTIVITIES:

1. Have your students make five minute recordings with portable tape recorders from different areas of the campus. The sound level should be set the same at each location. Try to get recordings during different times of the day. Plot the location on a campus map. Have the class identify the sounds they hear. Are any areas of campus noisier than other areas? What can be done about the noise in each area? Do the noise levels change during different times of the day? Why? How can shrubs and trees help in softening noise levels?

2. Use the walk-away test to determine the overall noise condition of your school. Divide your class into pairs and give each pair a textbook and a data sheet. The data sheet should have the following information: Names in groups; time of day; location on campus; noise level from noise chart. To use the walk-away test, one student stands at a fixed location while the other student, starting a distance of two feet, backs slowly away. The student standing at the fixed location should read from the text in a normal speaking voice. It is important that the speaker not raise his voice in order to maintain communication. When the person walking away can only understand a scattered word or two in a 10 second period, the listener should stop backing away. Measure the distance between the speaker and listener and compare the distance to the chart following RESOURCES.

EVALUATION: Students will demonstrate their knowledge of increasing problems of noise in our everyday environment and ways in which noise can be reduced.

RESOURCES: Film from:
The Indiana University Autio-Visual Center
Bloomington, Indiana 47401

"Noise - The New Pollutant"

## Noise Chart

| Noise Level | Distance Where Understanding Becomes Very Difficult | Noise Acceptability Level |
|---|---|---|
| #1 | More than 70 feet | Very acceptable |
| #2 | 26 - 70 feet | Acceptable |
| #3 | 7 - 25 feet | Not very acceptable |
| #4 | Less than 7 feet | Unacceptable |

## WORKSHOP PARTICIPANTS

Paul A. Coley, Consultant
Environmental Education Bureau, Florida Department of Education
Tallahassee, Florida

Robert E. Childs
Superintendent of Education, Jackson County, Marianna, Florida

John S. Braxton
Environmental Education Coordinator, Jackson County
Marianna, Florida

Virginia B. Blount, Chairman of Workshop
Teacher, Grand Ridge School, Grand Ridge, Florida

Elizabeth D. Christmas
Teacher, Marianna Middle School, Marianna, Florida

Sylvia S. Ingram
Teacher, Marianna High School, Marianna, Florida

Sarah S. Martin
Teacher, Marianna High School, Marianna, Florida

Ann H. Sims
Teacher, Marianna Middle School, Marianna, Florida

WillaDean Stokes
Teacher, F. M. Golson Elementary School, Marianna, Florida

Nell H. Perdue, Typist